73 AMATEUR RADIO

International Edition

NOVEMBER 1988
ISSUE #338
USA $2.95
CAN $3.95
A WGE Publication

Exclusive! Foxhunting

—Mobile Crossband Repeater

A Great IDer for Homebrewers

Rep
R

ALL FOR STATE*********
4802&8 SMC R00000Y99 3Y4DSAMPLE
UNIV MICROFILM COPY
SERIAL PRCNG ATTNLINDA LL#AV
300 N ZEEB RD
ANN ARBOR MI 48103

Reviews: CES 4-in-1 Controller

Maggiore 220 MHz Repeater

11
0 74820 08725 1

1.2GHz Pioneers

All ICOM 1.2GHz gear allows novices to talk on the air under the Novice Enhancement ruling!

ICOM 1.2GHz

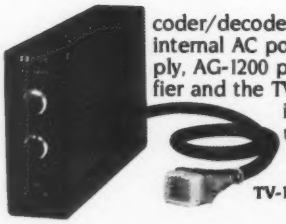
THE ONLY 1.2GHz SYSTEM... ANYWHERE

- IC-1271A Base Station
- IC-12AT Handheld
- NEW! IC-1200 Mobile
- IC-RP1210 Repeater

Explore 1.2GHz with ICOM. Only ICOM offers the most complete line of ham gear for 1.2GHz...the IC-1271A full-featured base station transceiver, the IC-12AT handheld, the new IC-1200 mobile and the IC-RP1210 repeater. So, get away from the crowd and be a pioneer on 1.2GHz.

The IC-1271A 1240–1300MHz base station transceiver features 10 watts of RF output power, 32 memories, scanning and multi-mode operation including ATV (amateur TV).

A variety of options are available for the IC-1271A including the IC-EX310 voice synthesizer, UT-15S CTCSS encoder/decoder, IC-PS25 internal AC power supply, AG-1200 preamplifier and the TV-1200 TV interface unit.



TV-1200

The IC-12AT handheld covers from 1260–1299.990MHz, has ten memory channels, memory scan, program scan and programmable offset. It also features an LCD readout, RIT and VXO, 32 built-in tones and a DTMF pad.

The new IC-1200 1.2GHz mobile transceiver has 21 memory channels, scanning, an HM-14 up/down scanning mic, RIT, large LCD readout and 10 watts power output. Accessories include the PS-45 slim-line external power supply.

The IC-RP1210 completes your 1.2GHz system. It features a field programmable (198 channel, DIP switch), high stability PLL, repeater access to CTCSS, three-digit DTMF decoder for control of special functions, 10 watts, selectable hang time and ID'er.

ICOM

First in ...

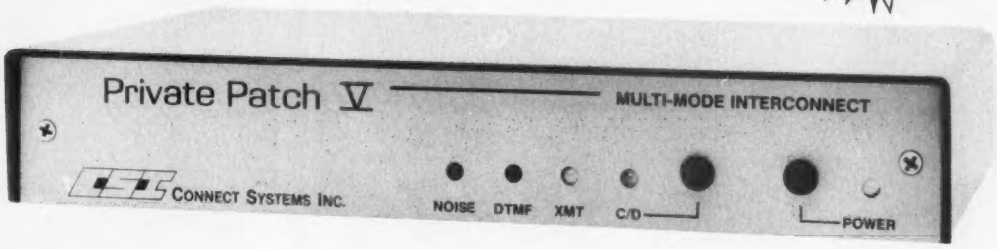
CIRCLE 354 ON READER SERVICE CARD

ICOM America, Inc., 2380–116th Avenue NE, Bellevue, WA 98004 **Customer Service Hotline** (206) 454-7619
3150 Premier Drive, Suite 126, Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 1.2GHz387

FOUR user selectable operating modes and a 90 number autodialer make Private Patch V the ONLY choice!

NEW!



SELECT AN OPERATING MODE USING THE BUILT-IN KEYBOARD . . .

1. SIMPLEX SAMPLING PATCH

Private Patch V achieves a level of sampling patch performance unobtainable in any other product. Crucial to performance is the noise squelch filter. Compare our five pole filter to the competition's two pole filter. Advanced software algorithms perform noise correlation tests which result in greater useable range than the competition. Nine selectable VOX enhancement ratios allow you to vary performance from straight sampling to highly VOX enhanced. (sampling rate decreased while the land party is speaking). The mobile is in full control and can break-in at any time.

2. SIMPLEX VOX PATCH

VOX mode offers superb simplex operation with any radio, including synthesized and relay switched models. VOX mode has other advantages too. **1.** A linear amplifier can be used to extend straight simplex range. **2.** You can operate through any remotely located repeater to greatly extend range. **3.** If desired you can connect Private Patch V to the MIC and speaker jack of your radio. NO INTERNAL CONNECTIONS ARE REQUIRED. Control is maintained automatically with built-in dial tone detection, busy signal detection and fully programmable activity and time out timers. An optional electronic voice delay board eliminates first word clipping with slow switching radios.

3. DUPLEX PATCH

Select duplex mode when connecting Private Patch V to your existing repeater or duplex base station. Many features including semi-duplex privacy mode are user programmable. The mobile is in full control at all times.

4. REPEATER CONTROLLER

Private Patch V will convert any receiver and transmitter into an outstanding performing repeater with duplex autopatch. Features such as repeater on/off code, hangtime, activity timer time, CW ID interval etc. are fully user programmable. Private Patch V is the right choice for your club system.

Private Patch V is a totally new concept in automatic phone patches. A built-in keyboard and menu driven display allow you to customize all modes, features, and functions specifically to *your application.*

Private Patch V can be a sampling patch today. A VOX patch tomorrow. And a repeater controller next year!

You may never need another patch again.

COMPARE THESE FEATURES . . .

- 90 phone number autodialer
- Last number redial
- Regenerated tone/pulse dialing
- Toll restrict: 1st and 2nd digit restrict, prefix lockout and digit counting
- 1-5 digit connect/disconnect code
- 2-5 digit secret toll override code
- User programmable CW ID
- Remote hook flash
- Auto disconnect on dialtone/busy signals
- Telephone remote base
- Remote controlled relay (relay optional)
- Lightning protected

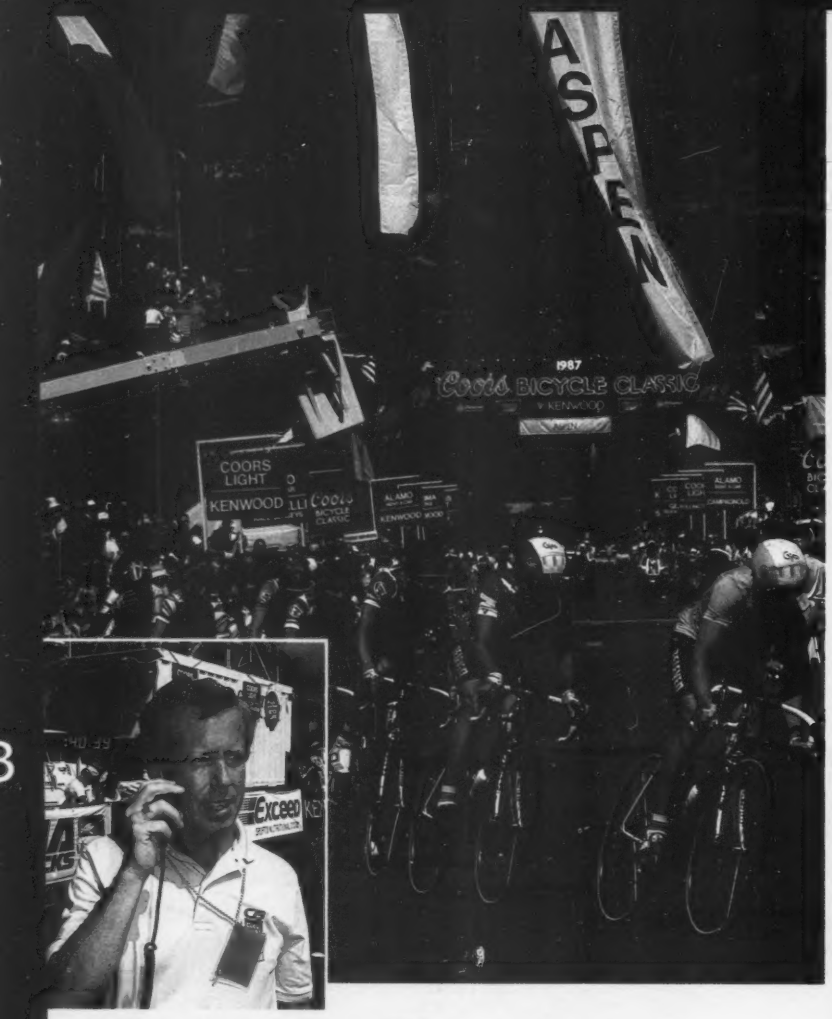
Call or write today for your FREE brochure.

CONNECT SYSTEMS INC.
23731 Madison St. Torrance, CA 90505
Phone: (213) 373-6803

AMATEUR ELECTRONIC SUPPLY: Milwaukee WI, Wickliffe OH, Orlando FL, Clearwater FL, Las Vegas NV • **BARRY ELECTRONICS CORP.:** New York NY • **ERICKSON COMMUNICATIONS:** Chicago IL • **HAM RADIO OUTLET:** Anaheim CA, Burlingame CA, Oakland CA, Phoenix AZ San Diego CA, Van Nuys CA, Atlanta GA • **HENRY RADIO:** Los Angeles CA • **INTERNATIONAL RADIO SYSTEMS:** Miami FL • **JUNS ELECTRONICS:** Culver City CA • **MADISON ELECTRONICS SUPPLY:** Houston TX • **MIAMI RADIO CENTER CORP.:** Miami FL • **MIKES ELECTRONICS:** Ft. Lauderdale, FL • **N&G DISTRIBUTING CORP.:** Miami FL • **OMNI ELECTRONICS:** Laredo TX • **PACE ENGINEERING:** Tucson AZ • **THE HAM STATION:** Evansville IN • **VALLEY RADIO CENTER:** Harlingen TX • **CANADA—COM-WEST RADIO SYSTEMS, LTD.:** Vancouver BC

CSI is a registered trademark of Connect Systems, Inc.

CIRCLE 12 ON READER SERVICE CARD



"You're miles ahead with Larsen."

Rick Woodsome, Communications Consultant
Woodsome and Associates, Boulder, Colorado

When the directors of the Coors International Bicycle Classic needed a sophisticated mobile communications system, they turned to communications consultant Rick Woodsome. As a communications specialist, Woodsome knows what it takes to make a communication system work.

That's why he turned to Larsen Antennas.

"You don't pull off the largest sports event in the Western Hemisphere without good communication. And you don't have good communication without the right equipment.

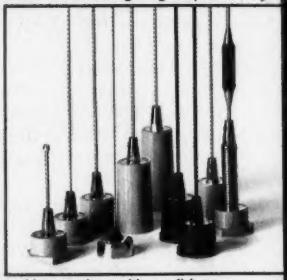
"Larsen antennas were instrumental in making last summer's Coors Classic an overwhelming success. They were key to our entire communication network.

"Without Larsen, it would have been uphill all the way."

Rick Woodsome

THE AMATEUR'S PROFESSIONAL.

Larsen Külrod® and Külduckie® antennas provide amateurs the same advantages enjoyed by commercial two way radio users. Both combine top performance with the long range dependability you want.



See your dealer for the complete line of Larsen antennas and permanent and temporary mounts. You can buy with confidence, because they're all backed by Larsen's No Nonsense Warranty for a full six months.

For a professional approach to amateur radio, tune in to Larsen.

Larsen Antennas

IN USA: Larsen Electronics, Inc., 11611 N.E. 50th Avenue, P.O. Box 1799, Vancouver, Washington 98668 (206) 573-2722. Toll Free order line: 1-800-426-1656. In Washington State: 1-800-562-1747. Telex: 15-2813 LARSENELC VANC. Fax: (206) 574-5703.

IN CANADA: Canadian Larsen Electronics, Ltd., 149 West 6th Avenue, Vancouver, B.C. V5Y 1K3 (604) 872-8517. Toll Free: 1-800-663-6734. Fax: (604) 872-8655.

CIRCLE 23 ON READER SERVICE CARD

MFJ TUNERS

Invest in the world's finest 3 KW roller inductor tuner with dummy load, new *peak* reading Meter and more . . .

The MFJ-989C is a compact 3 KW roller inductor tuner with a new **peak** reading Cross-Needle SWR/Wattmeter. The roller inductor lets you get your SWR down to absolute minimum.

With **three continuously** variable components -- two massive 6 KV capacitors and a high inductance roller inductor -- you get precise control over SWR **and** the widest matching range possible from 1.8-30 MHz.

You get a **new** lighted **peak** and average reading Cross-Needle SWR/Wattmeter with a **new** more accurate directional coupler.

You get a giant two core balun wound with teflon wire for balanced lines and a 6-position antenna switch with extra heavy switch contacts.

You get a 50 ohm 300 watt dummy load for tuning your exciter, a tilt stand for easy viewing and a 3-digit turns counter plus a spinner knob for exact inductance control.

Its compact 10¾x4½x15 inch cabinet slides right into your station.

The MFJ-989C is not for everyone. However, if you do make the investment, you'll get the finest 3 KW tuner money can buy -- one that will give you a lifetime of use, one that takes the fear out of high power operation and one.that lets you get your SWR down to absolute minimum

MFJ-989C **$349.95**

MFJ's *Best* VERSA TUNER II

MFJ-949C **$139.95**

The MFJ-949C gives you more precise matches than any tuner that uses two tapped inducters. Why? Because you get two **continuously** variable capacitors that give you infinitely more positions than the **limited** number on switched coils.

This gives you the precise control you need to get your SWR down to a minimum. After all isn't that why you need a tuner.

You also get a dual range lighted Cross-Needle SWR/Wattmeter, 6-position antenna switch, 50 ohm 300 watt dummy load, balun for balanced lines and continuous 1.8-30 MHz coverage -- all in a compact 10x3x7 inch cabinet that fits right into your station.

With MFJ's **best** 300 watt tuner you get an MFJ tuner that has earned a reputation for being able to match just about anything -- on that is highly perfected and has years of **proven** reliability.

MFJ's *smallest* VERSA TUNER

MFJ-901B **$59.95**

The MFJ-901B is our smallest -- 5x2x6 inches -- and most affordable) 200 watt PEP Versa tuner -- when both your space **and** your budget is limited. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced and coax lines continuously 1.8-30 MHz. Excellent for matching solid state rigs to linears. Efficient airwound inductor. 4:1 balun for balanced lines.

144/220 MHz *VHF* TUNERS

MFJ-920 **$49.95**

MFJ-921 **$69.95**

MFJ's newest VHF tuners cover both 2 Meters and the new Novice 220 MHz bands. They handle 300 watts PEP and match a wide range of impedances for coax fed antennas. MFJ-921 has SWR/Wattmeter.

MFJ's *Fastest Selling* TUNER

MFJ-941D **$99.95**

The MFJ-941D is MFJ's fastest selling 300 W PEP antenna tuner! Why? Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz.

It matches dipoles, vees, verticals, mobile whips, random wires, balanced and coax lines.

SWR/Wattmeter reads forward/reflected power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines, direct or through tuner, random wire/ balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. Has 4:1 balun. 1000 V capacitors. 10x3x7 inches.

MFJ's *Mobile* TUNER

MFJ-945C **$79.95**

Don't leave home without this **mobile** tuner! Have an uninterrupted trip as the MFJ-945C **extends your antenna bandwidth** and eliminates the need to stop, go outside and readjust your mobile whip.

You can **operate anywhere in a band and get low SWR.** You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

Small 8x2x6 inches uses little room. **SWR/ Wattmeter and convenient placement of controls make tuning fast and easy while in motion.** 300 watts PEP output, efficient airwound inductor, 1000 volt capacitors. Mobile mount, MFJ-20, $3.00.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

MFJ-1702, $19.95. 2-positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

MFJ-1701, $29.95. 6-positions. Unused positions grounded. For desk or wall mount.

$29.95 **MFJ-1701**

MFJ's *1.5 KW* VERSA TUNER III

MFJ-962C **$199.95**

For a **few** extra dollars, the MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1500 watt PEP linear amplifier later.

Two **continuously** variable 6 KV capacitors give you **precise** control for getting your SWR down to a minimum. And **lots of inductance** gives you the widest matching range possible.

You can read both **peak** and average power with the lighted 2-color Cross-Needle SWR/Wattmeter. A **new** directional coupler gives you more accurate readings over a wider frequency range.

Has 6-position **ceramic** antenna switch and a teflon wound two-core balun with ceramic feedthru insulators for balanced lines. 10¾x4½x14 7/8 in.

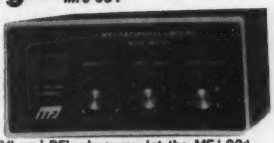
MFJ's *Random Wire* TUNER

MFJ-16010 **$39.95**

You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn any random wire into a transmitting antenna. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. Handles 200 watts. Ultra compact 2x3x4 in.

MFJ *artificial* RF ground

$79.95 **MFJ-931**



You can create an artificial RF ground and eliminate RF "bites", feedback, TVI and RFI when you let the MFJ-931 resonate a random length of wire and turn it into a tuned counterpoise. The MFJ-931 also lets you electrically **place a far away RF ground directly at your rig** -- no matter how far away it is -- by tuning out the reactance of your ground connection wire.

ORDER ANY PRODUCT FROM MFJ AND TRY IT -- NO OBLIGATION. IF NOT SATISFIED RETURN WITHIN 30 DAYS FOR A NO-HASSLE REFUND (less shipping). • One year **unconditional** guarantee • Add $5.00 each shipping/handling • Call or write for free catalog, over 100 products.

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762

FOR YOUR NEAREST DEALER OR TO ORDER
800-647-1800
Call 601-323-5869 in Miss. and outside continental USA. Telex 53-4590 MFJ STKV.
In CANADA call TEXPRO 416-332-5944.

MasterCard VISA

MFJ . . . making quality affordable

CIRCLE 24 ON READER SERVICE CARD

Welcome, Newcomers!

REPEATERS

Do you recall the Radio Shack walkie-talkies with which you could talk to someone up to a quarter of a mile away? Maybe this thrill led some of you to become involved in CB, where it was possible to talk with someone from you car reliably at a much greater distance—even 15–20 miles! It never fails to intrigue a non-ham friend of mine, however, when, using a hand-held radio no larger than one of the walkie talkies mentioned above, and putting out as little power, I communicate with someone *halfway across New England*—and with superb signal quality. And it's all due to an invention that moved onto the ham scene twenty or so years ago—the repeater.

A repeater's basic function is to receive a signal and rebroadcast it simultaneously. It is most useful for line-of-sight signals—those that travel in a straight line. These signals are usually FM for repeater use. The range of direct communications using line-of-sight signals, however, is limited due to the Earth's curvature and large obstructions, such as mountains. A repeater, especially when placed in an area that gives it a great range, such as on top of a mountain, can increase a line-of-sight signal's range by two or three times.

Imagine now linking two or more repeaters together. The range is then limited only by the number of repeater linkages. I often use a network of 14 repeaters located throughout New England, the 220 MHz repeater network, that allows repeater users to talk with hams from New York City to Montreal—over 400 miles apart! Networks like these are sprouting up all over the US, and gaining popularity in many other parts of the world.

Repeaters are quickly showing that the sky's the limit now with line-of-sight FM communications!

de NS1B 73

GLOSSARY

Autopatch - A device that weds a repeater system to the telephone system. This allows ham communications at the repeater to enter the telephone system.
Breaker - A ham who interrupts a conversation on the repeater, often to ask the current user's permission to make a brief call.
Channel Pair - The input and output frequency pair of a given repeater.
Closed Repeater - A repeater not open to general access.
Control Operator - The ham designated to police the repeater. He or she can activate or deactivate any of the functions, and even shut down the repeater. They control it either locally, or more commonly, remotely.
Courtesy Tone - That tone that sounds after a user ends a transmission and releases the Push-To-Talk button. This helps other users know when a user has finished transmitting.
Crossband - Communications on another amateur band though a link interfaced with the repeater.
Desense - Corruption of receiver sensitivity due to swamping the repeater receiver with overly strong signals.
Duplexer - A device usually made up of one or more pairs of large metal resonant cavities. It is fed with three transmission lines: one each from the repeater receiver and transmitter, and one from the antenna. It serves to separate the incoming and outgoing signals that flow simultaneously through the antenna system, preventing receiver desense.
Full Quieting - A received signal that is so strong that it entirely masks the ambient noise on its frequency.
Half-Duplex - This describes communication that takes place on two frequencies, with one as only the receive state, and the other as only the transmit state, at alternate times. Repeater operations are half-duplex. Telephone communications are full-duplex; they allow simultaneous transmit (talk) and receive (listen) states.
Handheld - Also known as handy-talkie, or HT. A transceiver small enough to be held in, and operated with, one hand.
Input - The repeater receiver frequency. This is the frequency a repeater user transmits on.
Intermod (IMD) - The result of the mixing of one or more undesired signals with a desired signal in the first RF amplification stages (front end) of a receiver.
Key-up - Causing a repeater to transmit by transmitting on its input (receive) frequency.
Kerchunk - To key up a repeater without modulating the input signal (such as by speaking into the rig). "Kerchunkers" are those who, usually unnecessarily, key up a repeater many times.
Offset - There are two common meanings for this word here. The first refers to the spacing between the input and output frequencies on a repeater or other transceiver. The spacing and the offset is standardized for most bands.

The second refers to the control on a rig that sets the input and/or output frequency to a point between the standard frequency steps of that band. For example, 2 meter synthesized FM rigs step through frequencies in 10 kHz steps, and most repeater channel pairs are located on these increments. Five kHz is a common offset adjustment on these rigs.
Output - The frequency on which the repeater transmits. This is the receive frequency for a transceiver of a person using the repeater.
Picket-fencing - Rapid flutter on a mobile signal resulting from multipath fading. This oftens occurs in urban areas where signals collide off buildings.
Polarization - An electromagnetic wave has two planes of energy—the electric field plane (E-plane) and the magnetic field plane (H-field). These planes are perpendicular to each other. Polarization refers to the orientation of the E-field; either parallel to the Earth's surface (horizontally polarized) or perpendicular to the Earth's surface (vertically polarized).

Repeater antennas are usually vertically polarized, because the antenna systems of most transceivers that use repeaters—such as whips mounted on car roofs or hand-held radio antennas—have the same polarization.
Reverse Autopatch - This is a device that, like an autopatch, weds a repeater system to a telephone system. This allows a telephone user to initiate radio communications through the repeater.
Simplex - Communications via only one frequency.
Split Sites - Refers to a repeater system that has separate transmitter and receiver sites, and are connected either by radio or by telephone lines. These systems don't require a duplexer since the transmit and receiver posts use different antenna systems, and are sufficiently far apart to prevent repeater receiver desense.
Squelch Tail - The noise burst that follows the short unmodulated carrier following each repeater transmission.
Timer - A control in the repeater that shuts down its transmitter after a continuous input exceeds a preset time limit. This keeps long-winded users from tying up the machine. The time limit is usually set at 1½–3 minutes.
Tone Pad - Also know as Dual-Tone Multiple-Frequency (DTMF) pad. It generates the standard telephone system tones that control various repeater functions.

QRM

Editorial Offices
WGE Center
Peterborough NH 03458-1194
phone: 603-525-4201

Advertising Offices
WGE Center
Peterborough NH 03458-1194
phone: 800-225-5083

Circulation Offices
WGE Center
Peterborough NH 03458-1194
phone : 603-525-4201

Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB") or on disk as an IBM-compatible ASCII file. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

Reprints: The first copy of an article—$3.00 (each additional copy—$1.50). Write to 73 Amateur Radio Magazine, WGE Center, Rt. 202 North, Peterborough, NH 03458. ATTN: Article Reprints.

Subscription Information

One Year (12 issues) $24.97; Two Years (24 issues) $44.98. Canada, Mexico and Foreign Surface: One Year $31.75 (US Funds); Two Years $57.00 (US Funds). Foreign Airmail: One Year $39.00 (US Funds); Two Years $70.00 (US Funds). Send new or renewal notices, inquiries, and change of address to *73 Amateur Radio*, P.O. Box 58866, Boulder CO 80322-8866. Allow 4-6 weeks for subscription and change of address processing. For Customer Service, call toll-free at 1-800-525-0643. Colorado/Foreign subscribers call 1-303-447-9330. For renewals and changes of address, please include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of the gift recipients. Second class postage paid at Peterborough NH 03458, and at additional mailing offices. Canadian second class mail registration number 9566. Microfilm Edition—University Microfilm, Ann Arbor MI 48106.

Contract: Reading this binds all you electronikers out there in Hamdom to perform the following: 1) Send for our Writer's Guide. 2) Following the instructions therein, apply at least one of your brainchilds to film, paper, and/or diskette. 3) Send to us in article form for everyone to benefit. No cavilling about how you can't write—everyone can! You'll feel better, and you even get paid.

73 AMATEUR RADIO (ISSN 0889-5309) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, 70 Rte. 202N, Peterborough, NH 03458-1194. Second-class postage paid at Peterborough, NH and additional mailing offices.

Postmaster: Send address changes to *73 Amateur Radio*, P.O. Box 58866, Boulder CO 80322-8866.

73 AMATEUR RADIO

NOVEMBER 1988 — Issue # 338

TABLE OF CONTENTS

FEATURES

18 Homing in
Find out about the fun of RDF K0OV

22 All About Henry
Wide range inductance checker WB4DCV

27 Lap Top Repeater Controller
Why build more hardware than you have to? KF5WO

39 Kenwood 4100A Crossband Repeater
Convert your mobile rig to a two-band repeater W3RW

45 Ultimate Repeater IDer
Store a library of IDs to choose from K7PF

49 Computerized Tuning
Tune your rig from a micro keyboard KF6DF

55 Life of a Megacycle
The joy of bicycle mobile HF N4RVE

REVIEWS

10 Maggiore Hi Pro Basic Repeater
Check this out before spending a bundle on a machine K1ZJH

11 Hazer Antenna
Goes where you don't want to W5PFG

13 Kenwood TM-221A
Honorable descendant of the TR-7400 ..... KT2B

14 CES 510SA-II Enhanced Telephone Interconnect
A solid full-featured controller WA4TEM

24 RF Concepts Model 3-312 220 MHz Power Amplifier
The pick of the bricks KT2B

51 LF Engineering L-101S Receiving System
Quick way to listen in on VLF WB9RRT

62 Nye-Viking MB-V-A 3000 Watt Antenna Matcher
Who says they don't make'em like they used to? KA1XO

63 Orion HT Antenna
Get the most performance out of your hand-held W7XU

BOOK REVIEW

37 Wishbook of Circuits
A potpourri of circuits WB9RRT

DEPARTMENTS

FEEDBACK... FEEDBACK!
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

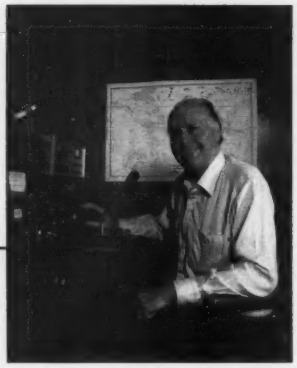
88 Ad Index
70 Aerial View
77 ATV
81 Barter 'N Buy
102 Dealer Directory
69 DX
17 Feedback
72 Ham Help
59 Hamsats
88 Index: 11/88
82 Letters
80 Looking West
6 Never Say Die
64 New Products
60 Propagation
52 QRP
9 QRX
73 QTH DX
95 73 International
74 Special Events
67 Tech Tips
4 Welcome, Newcomers

Cover photo by Tom Curlee

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1



Life After Death

It's only by accepting the FCC figures on ham licenses at face value that we have the appearance that amateur radio is growing at about 1.5% per year. But just how accurate are those figures? Alas, the answer is: not very.

I'll accept that the FCC's computer is able to keep pretty good track of the new licensees and upgrades. I've no complaints there. But it's only by trying to maintain the fiction that hams, unlike other people, do not die, that the FCC is able to make it look as if our numbers have been significantly growing.

The hole in the FCC fabric is a big and obvious one. They have no mechanism for finding out when our smoking, drinking, overeating, and lack of exercise of anything but our jaw, volunteers us for that last glorious mention in *QST*: Silent Keys. The result is that, like Chicago voting lists, deceased hams are carried on the FCC's books for up to ten years, making the numbers look substantially better than they are.

How much? Well, we can't tell exactly, but even if we only go by the full page Silent Key lists in *QST*, we know there's a bunch. One way to get a handle on the FCC's ghostly inflated figures is to check with insurance company actuarial tables and see about how many hams are, on the average, dying every year.

Some estimates of the average ham age are as high as 59 (that I believe), and some are as low as 50 (that is much more difficult to believe). Anyway, let's look at the actuarials for 53 and see what that does to the FCC figures. At 53 we can expect 10.1 deaths per thousand. The FCC says we have 435,000 licensees, which would lead us to expect 4400 ham gear sales by ham widows per year. Since the FCC takes ten years to discover that a ham is either operating on a completely new wavelength or has lost interest in the hobby, we could have as many as 44,000 phantom hams. And that doesn't count those semi-live hams who have lost interest in the hobby and have no intention of becoming active or even renewing their ticket. I constantly run into ex-hams at electronic shows, so I know there are a lot of them.

We know that less than half of the licensed hams are active, so if half of the remainder drop out when renewal time comes along, we could be losing several thousand more a year.

Anyway, the bottom line is to take those rosy figures showing ham growth with a big dose of salts. Hello *QST*, are you reading this?

So, okay, the 54% drop in new licensees in the last four years has been made to look like less of a disaster by a bit of fiction. So what's the harm? Well, one harm is that a depressing number of old time hams believe the fiction and believe the pollyanna *QST* reports of all being well. If things are going well, let's ignore doom and gloomer Wayne—boo on Wayne and his anti-code baloney. He's just hot air—trying to sell more subscriptions to his lousy rag. He's just trying to get rich off us old timers.

Get rich, eh? I'll tell you what, if there are any wealthy hams out there who are interested in a deal, here's one to think about. If you'll guarantee to cover any possible *73* losses each year, I'll guarantee you can have all the profits. Now doesn't that sound like a great way to make a mint fast? Get down off that turnip truck and give me a call. News flash for you: there's only one ham magazine making big profits and that's *QST*—they have millions salted away for a rainy day. How hard does it have to rain for them to start actually doing something to get amateur radio growing? And I'm not putting down the ARRL, I'm putting you, the members, down for not saying word one. As long as you aren't the least bit interested in what they do or in get-

Continued on page 84

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

STAFF

PUBLISHER/EDITOR
Wayne Green W2NSD/1

ASSOCIATE PUBLISHER
Stuart Norwood

MANAGING EDITOR
Bryan Hastings NS1B

SENIOR EDITOR
Rebecca Niemela

COPY EDITOR
Linda Reneau

EDITORIAL ASSISTANT
Martha Gouse

TECHNICAL EDITOR
David McLanahan WA1FHB

INTERNATIONAL EDITOR
Richard Phenix

ART DIRECTOR
Bob Dukette

GRAPHIC DESIGN MANAGER
Deborah Smith

GRAPHIC DESIGNER
Marilyn Moran

JAPANESE TRANSLATOR
David Cowhig WA1LBP

ASSOCIATES
Mike Bryce WB8VGE
Leon Fletcher N6HYK
Jim Gray W1XU
Chod Harris VP2ML
Dr. Marc Leavey WA3AJR
Andy MacAllister WA5ZIB
Bill Pasternak WA6ITF
Peter Putman KT2B
Mike Stone WB8QCD
Arliss Thompson W7XU

ADVERTISING
1-603-525-4201
1-800-225-5083

SALES MANAGER
Ed Verbin

ADVERTISING SALES
Jim Ball

SALES SERVICES MANAGER
Hope Currier

WGE PUBLISHING, INC.

CHIEF FINANCIAL OFFICER
Tim Pelkey

CIRCULATION DIRECTOR
Rodney Bell

TYPESETTING/PAGINATION
Bob Dukette, Systems Supervisor
Steve Jewett KA1MPM, Linda Drew, Susan Allen, Ruth Benedict

GRAPHICS SERVICES
Richard Clarke, Manager
Sue B. Flanagan, Dale Williams

GRAPHICS PHOTOGRAPHER
Dan Croteau

Editorial Offices
WGE Center
Peterborough, NH 03458-1194
603-525-4201
Subscription Customer Service
1-800-525-0643
Colorado/Foreign Subscribers
call 1-303-447-9330

Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0889-5309) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

Entire contents © 1988 by WGE Publishing, Inc. No part of this publication may be reproduced without written permission from the publisher.

KENWOOD

...pacesetter in Amateur Radio

DX-cellence!

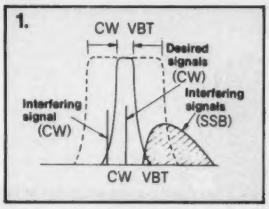
#1 Rated HF!

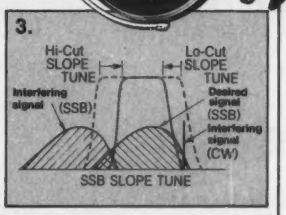
TS-940S

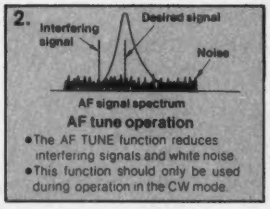
Competition class HF transceiver

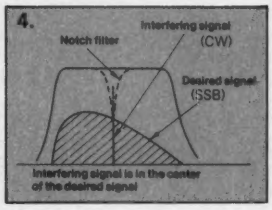
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

- **100% duty cycle transmitter.** Kenwood specifies transmit duty cycle ***time.*** The TS-940S is guaranteed to operate at full power output for periods ***exceeding one hour.*** (14.250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in ***parts per million!***






2.
Interfering signal
Desired signal
Noise
AF signal spectrum
AF tune operation
•The AF TUNE function reduces interfering signals and white noise.
•This function should only be used during operation in the CW mode.



1) CW Variable Bandwidth Tuning. Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes QRM from nearby SSB and CW signals.

2) AF Tune. Enabled with the push of a button, this CW interference fighter inserts a tunable, three pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSOs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.

3) SSB Slope Tuning. Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

4) IF Notch Filter. The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting ham.** Large fluorescent tube main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate.
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (QSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band scan or 40 channel memory scan.

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters • IF-232C/IF-10B computer interface.

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications, features, and prices are subject to change without notice or obligation.

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

KENWOOD

...pacesetter in Amateur Radio

NEW!

Affordable DX-ing!

TS-140S

HF transceiver with general coverage receiver.

Compact, easy-to-use, full of operating enhancements, and feature packed. These words describe the new TS-140S HF transceiver. Setting the pace once again, Kenwood introduces new innovations in the world of "look-alike" transceivers!

- **Covers all HF Amateur bands with 100 W output.** General coverage receiver tunes from 50 kHz to 35 MHz. *(Receiver specifications guaranteed from 500 kHz to 30 MHz.)* Modifiable for HF MARS operation. *(Permit required).*
- **All modes built-in.** LSB, USB, CW, FM and AM.
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.

- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.
- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.

- **M. CH/VFO CH sub-dial.** 10 kHz step tuning for quick QSY at VFO mode, and UP/DOWN memory channel for easy operation.
- **Selectable full (QSK) or semi break-in CW.**
- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

Optional Accessories:

• **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface • **MA-5/VP-1** HF mobile antenna (5 bands) • **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** disk mics. • **PG-2S** extra DC cable • **PS-430** power supply • **SP-40/SP-50B** mobile speakers • **SP-430** external speaker • **SW-100A/SW-200A/SW-2000** SWR/power meters • **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit • **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter.

TS-680S

All-mode multi-bander

- 6m (50-54 MHz) 10 W output plus all HF Amateur bands (100 W output).
- Extended 6m receiver frequency range 45 MHz to 60 MHz. Specs. guaranteed from 50 to 54 MHz.
- Same functions of the TS-140S except optional VOX (VOX-4 required for VOX operation).
- Preamplifier for 6 and 10 meter band.

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

QRX . . .

EDITED BY BRYAN HASTINGS NS1B

Reallocation

"Amateur stations may continue to use the 220–222 MHz band until Private Land Mobile and government users are allowed access. Amateur operators are cautioned, however, to refrain from making any investment in equipment suitable for operation only in this band. Amateurs should begin an orderly transition of ongoing operations in the 220–222 MHz band to other amateur service frequency bands so that an abrupt termination of such activities will not be necessary."

That was just one of the summary conclusions from the text of the Report and Order on General Radio Docket 87-14, that, among other things, orders the transfer of 220–222 MHz over to use by land mobile interests. The 10-page document issued 6 September, closely paralleled the FCC Press Release of 4 August.

As a part of the same concluding statement, the Report and Order hinted that the FCC is aware of the hardships the reallocation will cause to current 1¼ meter amateur operations:

"...the amateur community may wish to address any changes to the amateur rules it finds desirable in preparation of the removal of the 220–222 MHz band. For example, the lifting of the prohibition on auxiliary link operation on some of the longer wavelength bands and the placing of a prohibition on repeater operation in a portion of the 222–225 MHz band are two matters the amateur community may wish to consider and petition for amendment."

For a fuller discussion on the reallocation of 220–222 MHz, see this month's "Looking West."

Microsat

The AMSAT-NA Microsat project took a big step forward in late August when accurate models of the generic satellite passed a rigorous series of shake and vibration tests. The tests subjected the Microsat bus to vibration levels much higher than those to which AO-13 was subjected.

According to W3GEY, the prototype Microsat passed the tests with flying colors. Acceleration levels over 14 Gs in the vibration test and over 44 Gs in the shock test caused no problems for the rugged microsat bus. The tests were performed at Utah State University in Logan.

For those not aware of this project, AMSAT-North America (AMSAT-NA) President Vern Riportella WA2LQQ announced plans on 30 July to launch four microsatellites from a single European Space Agency (ESA) Ariane launch vehicle. These satellites are truly small, measuring only 9" cubed and weighing only 22 lbs. Two of these microsats are planned as "Pac-Sats"—store and forward packet satellites. AMSAT-NA and AMSAT-LU (Argentina) will each operate one of the Pac-Sats. The other two birds will be special purpose amateur satellites. One is being sponsored by Brazil AMSAT (BRAMSAT), and will carry DOVE (Digital Orbiting Voice Encoder) This satellite will carry a synthesized voice transmitter. The final satellite is sponsored by the Center for Aerospace Technology (CAST) at Weber State College of Ogden Utah, and will carry a low resolution camera.

Writer's Guides

Warm up your pens, typewriters, and word processors! The new *73 Magazine Writer's Guide* is ready for distribution. Along with that goes a sheet with pointers on shooting photos you would like considered for the cover of *73*.

Compuserve and GEnie users will be happy to know they can download the Guide to their systems. Of course, you can obtain a hard-copy of the Guide via conventional mail at the address listed at the end of this column. Send your request to the attention of Martha Gouse.

Space Hotline

A new dial-up voice space news service is on line. The Space Activities Hot Line (SPACHL) carries the very latest news on amateur radio satellite operations, related radio nets, and general world space activities.

The five-minute recorded announcement carries details of times and frequencies. It might be a good idea to record the bulletin since it flows quickly and gives many details and numbers.

An added special feature of SPACHL is the SPACHL Technical Service. OSCAR users can get free technical advice on getting their stations running and keeping them in top shape. Simply dial the SPACHL number and, at the tone, leave a short message indicating your name, callsign, telephone number, the time of day you would prefer to be called and the nature of the problem. An expert in that field will call you (collect) within a week to give free guidance on getting your OSCAR station operating or on other related problems.

This service is so far available only in the US and Canada. The number to call is (914) 986-3875. SPACHL will be available 24 hours/day. Bulletins will be updated daily. SPACHL is a private, volunteer service provided by WA2LQQ.

17 METERS

On 1 September, the FCC released PR Docket 88-467 that proposes the opening of the 17 meter band for amateurs in the United States. The rule-making procedure will lay out the band plan. The docket proposes giving amateurs access to the entire band, 18.068 to 18.168 MHz, with a 42 kHz CW/Digital emissions subband from 18.068–18.110 MHz. The balance of the band would be for phone, FAX, and television emissions of the types authorized for use below 30 MHz. According to the Commission proposal, only General class and above licensees would have access to 17 meters. Power limitations would be the same as for other high frequency amateur allocations.

The final acts of the 1979 World Administrative Radio Conference allocated 18.068 to 18.168 MHz to the amateur and amateur satellite services. Normally a two-step process follows on a domestic level after such an allocation is made internationally. The FCC took the first step by amending the domestic Table of Allocations to add 17 meters to the amateur services. The second step—the issuance of this NPRM—awaited the removal of the government-fixed services from the band. These operations must cease no later than 1 July 1989.

Ham Call Directory On Packet

This is an ideal system for packeteers who don't have the Callbook. Jim Dearras WA4ONG of Richmond VA has a database of US ham addresses up to December 1987 resident on CD-ROM which he has interfaced with his PBBS. They may be addressed by a simple packet radiogram. The callsign info is from Buckmaster Publishing and is stored on CD-ROM.

There are two ways to access address information. If you're local to the BBS (145.01 MHz), simply type in "OS QTH (desired callsign)." The address will usually appear on your home PBBS. You can ask for multiple addresses by separating callsigns with a space or comma.

Non-local users should log on to their local BBS and send "SP REQQTH @ WA4ONG." When the PBBS prompts you for the title, type in the calls of the desired addresses, again separated by spaces or commas. At the end, put an @ and then your home PBBS call to allow the WA4ONG PBBS to forward these messages.

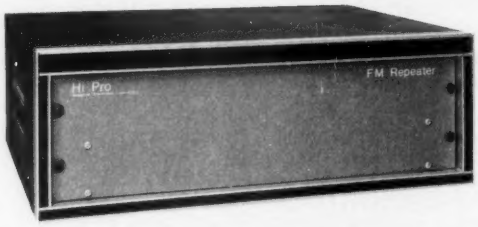
The HF gateways for this system are WB0TAX Hampton VA, and W3IWI in Maryland, both on 20 meters. Packeteers as far away as Australia have obtained addresses through this system!

Thanks . . .

to *Westlink, Gateway, Chattering Relay, The BirmingHam,* and WA6WZO for furnishing this month's news items. Keep your ham-related news items and photos rolling in to *73 Magazine*, 70 Rte. 202 N, Peterborough, NH 03458-1194. Attn: QRX.

73 Review by Peter J. Bertini KIZJH

The Maggiore Hi Pro Basic Repeater



High quality repeater at a reasonable price.

Maggiore Electronic Laboratory
600 Westtown Road
West Chester, PA 19382
(215) 436-6051
Price: $1,001

My club, the Mt. Tom Amateur Repeater Association, made a commitment to put a 220 MHz repeater on the air. It seemed improbable, however, with only $1500 in hand to cover the costs of the repeater, duplexer, and antenna. The club was already supporting three two meter machines, and with our 220 MHz amateur allocation in jeopardy, few members were willing to risk a large personal or club investment.

Then we noticed an ad from Maggiore Electronics Laboratory (MELCO) in an issue of *73 Magazine*. A phone call brought quick results. Within a few days, we received Maggiore's latest catalog in the mail. Another phone call to Frank Maggiore was equally productive—yes, we could buy the Maggiore Hi Pro Basic repeater (their lowest-priced repeater) without the internal power supply. And yes, we could have the optional 25 watt PA and HPC201 microprocessor controller/autopatch installed.

The price seemed too good to be true. Half-heartedly, I mailed the check and rationalized to myself, "Even if it only runs a year and croaks, the club will then be in a better position to replace it with a 'known' brand." That was over three years ago with faultless service.

Simple and Direct

The Hi Pro Basic isn't much to look at. Its front panel is void of light shows, controls, or even a power switch! The Maggiore Basic repeater packs into a tiny 11-pound package.

The COR1 identifier and timer board come with the Basic package, but I suggest you consider substituting them with the optional HPC201 microprocessor controller/autopatch. *(See the HPC201 review in a future issue.)*

The Basic repeater is normally supplied with a 15 watt transmitter. The repeaters shipped with one set of crystals, tuned and ready to run.

Transmitter Performance

Two of our two meter repeaters, a GE Master Pro and a Spectrum 77, are also using 30 watt transmitter assemblies from Maggiore. This represents several years of aggregate service on busy wide-area coverage repeaters with no transmitter failures to date. One nice thing we quickly noticed about these transmitters is their ability to make rated power output at the specified DC supply voltage.

Power sag—a common repeater woe— is the annoying tendency for power output to slowly fall off after a transmitter has been on for a while. It can be caused by inadequate heatsinking, poor design, or both. The repeaters are monitored daily with commercial service monitors and the long-term frequency stability has held within a few hundred cycles on all of the transmitters.

The 220 MHz repeater is running a Wacom WP-652 duplexer (Maggiore Electronics) and a Falcon MOSFET repeater power amplifier at 70 watts output. A Hamtronics GaAsFET preamp is also being used on the receiver. No measurable desense was found with the higher power levels.

Our three two meter repeaters now using the 30 watt Maggiore transmitters drive bipolar power amps with power outputs in excess of 100 watts. The repeater receivers are also using preamps. As with the 220 MHz system, no problems with receiver desense was noted, thanks to the absence of transmitter noise.

None of the transmitters showed signs of instability when operating into the reactive loads which duplexers can present, or when driving external power amplifiers. Tuning is smooth, with no unusual power jumps or other anomalies. A Cushman CE-15 spectrum analyzer verified that the transmitters were clean and free of spurious output.

The EV-1 exciter is rated at 4.5 watts output continuous duty; optional power amplifiers are available from 15 to 40 watts. The power amplifier mounts in the die-cast aluminum housing with the exciter. Power output may be set via an internal drive control. The EV-1 transmitter is used in the two meter and 220 MHz repeaters.

The R4V Receiver

The Maggiore R4V VHF receiver is dual-conversion design, using 10.7 MHz and 455 kHz first and second IFs. A six-pole monolithic crystal filter follows the first mixer. A Murata E ceramic filter (5.5 kHz bandwidth) at the lower IF frequency really sharpens things up. There's a Murata F Filter with a 4.5 kHz bandwidth available for those repeaters plagued by extremely strong signals on adjacent 15 kHz channels. Another two-pole 10.7 MHz filter can be added. Both of our Basic repeaters have the six-pole filters and the 5.5 kHz Murata filters. The Maggiore receivers are FCC certified for commercial use.

Dual-gate MOSFETs are used in the RF and first mixer stages. Five top-coupled LC stages provide good RF selectivity at the operating frequency. A third-overtone crystal in a bipolar oscillator, followed by a bipolar tripler stage, generates the desired LO frequency for mixer injection. The remaining receiver circuitry uses ICs. The R4V receiver is used in the 144 MHz and 220 MHz repeaters.

R4V receivers do not have the problem of the squelch breaking in the presence of electrical noise, such as from lightning discharges or power lines. Sensitivity was best with the receiver squelch set at its threshold. Once set, the squelch is stable.

I mentioned earlier that we use Hamtronics GaAsFET preamps on our receivers. The R4V receiver has a hot front end, and unless the repeater is located in an extremely quiet RF environment, I doubt you will note the difference. If you must use a preamp, the Hamtronics repeater preamp is your best bet for several reasons: they have fairly low gain (about 10 dB) and use sharp helical resonators. You might be surprised by how many repeater receiver problems can be caused by preamps!

The documentation for the Maggiore Hi Pro Basic repeater is adequate. Separate booklets cover each repeater component. Parts lists, schematics, alignment, and general technical information are provided. The repeaters are well made, the PC boards are mil-spec G-10 glass-epoxy, and the board layouts are clean and uncluttered. The receiver and transmitter are housed in rugged die-cast aluminum enclosures, and all signal and power feeds are via feedthrough capacitors. The parts are generic and most are readily available.

And, last but not least the customer support is excellent! The Hi-Pro is a fine bargain. 73

73 Review *by W. Max Adams W5PFG*

Raise the Hazer!

Glen Martin Engineering, Inc.
Rt. 3, Box 322
Boonville MO 65233
Price Class: $278 (Model H-4HG)

No longer go out on a limb to work on your beam.

What's the big deal about this odd triangle-shaped frame? Well, the Hazer can lower your antenna farm for ground work, which is enormously convenient and a great relief to a cowardly tower climber like myself! What follows is a review of a model of this intriguing piece of equipment, the Hazer Model H-4HG.

The Arrival

The UPS man delivered a couple of boxes from Glen Martin Engineering, both packed in conventional heavy duty cardboard. The smaller one measured 15″ x 16″ x 10″ and the other was a 6″ sided triangle shaped box 46″ long. Inside the small box was assorted hardware, a smaller box, and a single sheet of instructions.

The Instructions

The front page outlines the three assembly steps: the construction of the Hazer around the tower, the fastening of the winch on the tower at an appropriate level, and the installation of a wire rope pulley. Eight notes followed the steps offering some obvious, and a few not-so-obvious, precautions. The next paragraph described assembly and testing instructions.

The back page has a detailed homebrew drawing of an assembled Hazer complete with item numbers matching a nearby part list, and several detailed sketches of various assembly procedures. The assembly team—Jim Blankenship N5KYO, Stew Wells K5PWD, Glen "Blackie" Blankenship KD5LM, and myself—found these instructions to be quite adequate.

Assembly

We assembled the three Hazer side parts separately. Two side parts were connected with #2 lugs. The rotor and thrust bearing plates were loosely attached to one of the side parts—bolts were installed with their threaded end facing downward. The two-part assembly was placed around the tower, just above the house bracket, with the rotor and thrust bearing plates on the side opposite the house. The third side part easily fit the two-part assembly and was fastened with #2 lugs. We periodically checked clearance and alignment while tightening all bolted joints.

Pulley bracket assembly was first thing we installed on the Hazer side, near the top section tube skirt. This location caused the wire rope to rub on the top (horizontal) Z-brace, a less than desirable condition. Installing the pulley bracket on the Z-brace eliminates rope/tower friction and prevents binding caused by top Z-brace interference when raising Hazer to its maximum height.

Winch installation presented only one minor problem—because of double thick construction across one pair of its mounting holes, the U-bolts provided were about ¼″ short of filling the nut threads. A right angle grinder, with metal cutting disk, reworked the tower leg saddle clamp to provide an additional ¼″ of thread exposure. Otherwise, winch mounting went smoothly. The stiff 3/16″ wire rope presented a problem. Wrap the cut end with plastic tape, and form a kink near the end. This prevents fraying and makes installation of its hold-down clamp easier. Do not attempt to cut the wire rope with ordinary diagonal pliers—use a bolt cutter or other similar tool.

Operation

Using the Hazer is a piece of cake. A spring loaded safety latch engages each Z-brace (horizontal portion), when raising the assembly. Loosening the winch slightly, after the latch engages the last Z-brace, transfers the entire Hazer/Antenna assembly load to the Z-brace. Since the mast center line is only 3-½ inches from the tower face, side loading is much less than one "skinny" tower climber! When lowering Hazer and the antenna assembly, a nylon pull cable releases the latch, one Z-brace at a time. The assembly, accidentally dropped, falls less than one foot!

Continued on page 20

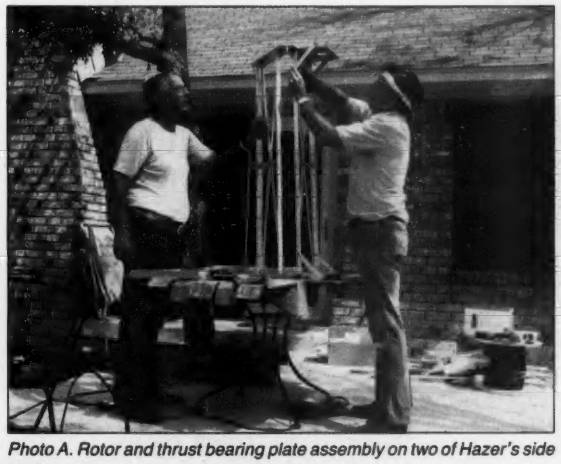


Photo A. Rotor and thrust bearing plate assembly on two of Hazer's side parts.

Photo B. Hazer rope wire pulley assembly installation at the top of the tower. We installed the Hazer during the tower installation.

KENWOOD

...pacesetter in Amateur Radio

NOW Four to choose!

Four to Go!

TM-221A/321A/421A/521A

144/220/450/1300 MHz

The Hottest Selling Compact FM Mobile Transceivers

The all-new TM-221A, TM-321A, TM-421A and TM-521A FM transceivers represent the "New Generation" in Amateur radio equipment. The superior Kenwood GaAs FET front end receiver; reliable and clean RF amplifier circuits, and new features all add up to an outstanding value for mobile FM stations! The optional RC-10 handset/control unit is an exciting new accessory that will increase your mobile operating enjoyment!

- **TM-221A receives from 138-173.995 MHz.** ***This includes the weather channels!*** Transmit range is 144-148 MHz. Modifiable for MARS and CAP operation. (MARS or CAP permit required.)
- **TM-321A covers 220-224.995 MHz, TM-421A covers 438-449.995 MHz, and the TM-521A covers 1240-1300 MHz.** (Specifications guaranteed for Amateur band use only.)
- **Built-in front panel selection of 38 CTCSS tones.** TSU-5 programmable decoder optional.
- **Simplified front panel controls**—makes operating a snap!
- **16 key DTMF hand mic., mic. hook, mounting bracket, and DC power cable included.**
- **Selectable frequency steps** for quick and easy QSY.
- **TM-221A provides 45 W. TM-321A 25 W, TM-421A 35 W, and TM-521A 10 W.** All models have adjustable low power.
- **Packet radio compatible!**
- **Programmable band scanning with memory scanning and memory channel lock-out.**
- **New amber LCD display.**
- **Kenwood non-volatile operating system.** All functions remain intact even when lithium battery back-up fails. (Lithium cell memory back-up, est. life 5 yrs.)
- **14 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2 m is automatically selected.** There are **two channels** for "odd split" operation.
- **Super compact:** approx. 1-1/2"Hx5-1/2"Wx7"D.
- **Microphone test function on low power.**
- **High quality, top-mounted speaker.**
- **Rugged die-cast chassis and heat sink.**

RC-10 Remote Controller

For TM-221A/321A/421A/521A. Optional telephone-style handset remote controller RC-10 is specially designed for mobile convenience and safety. All front panel controls (except DC power and RF output selection) are controllable from the RC-10. One RC-10 can be attached to **a combination of two transceivers** with the optional PG-4G cable. When two transceivers are connected to the RC-10, **cross band, full duplex repeater** operation is possible. (A control operator is needed for repeater operation.)

Optional Accessories:

• **RC-10** Multi-function handset remote controller • **PG-4G** Extra control cable for second transceiver • **PS-50/PS-430** DC power supplies • **TSU-5** Programmable CTCSS decoder • **SW-100A** Compact SWR/power/volt meter (1.8-150 MHz) • **SW-100B** Compact SWR/power/volt meter (140-450 MHz) • **SW-200A** SWR/power meter (1.8-150 MHz) • **SW-200B** SWR/power meter (140-450 MHz) • **SWT-1** Compact 2 m antenna tuner (200 W PEP) • **SWT-2** Compact 70 cm antenna tuner (200 W PEP) • **SWC-4** 1200 MHz Directional coupler. • **SP-40** Compact mobile speaker • **SP-50B** Mobile speaker • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MC-55** (8-pin) Mobile mic. with gooseneck and time-out timer • **MA-4000** 2 m/70 cm dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mobile mount

Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

73 Review *by Pete Putman KT2B*

Kenwood TM-221A 2 Meter FM Transceiver

As user-friendly as the TR-7400A— with more power out in a smaller box!

Kenwood USA Corp.
PO Box 22745
Long Beach, CA 90801-5745
(213) 639-4200
Price: $440

I had so much fun using the TM-221A in the car that it was hard to take time to write it up! This is one of the more user-friendly two meter transceivers on the market today—the beauty of its design is the overall simplicity. This is very welcome in this day of bells, whistles, foghorns, CRTs, readouts and 5,000 plus knobs and whatever else one finds on "full-featured" rigs.

The TM-221A.

Worthy Replacement

For many years, my tried and tested two meter radio was also a Kenwood of 1978 vintage. Many readers will recall the legendary TR-7400A that set the two meter crowd abuzz with full 800 channel synthesis, a super-selective receiver, and more than 25 watts output. In that time of rock-bound rigs, the design was truly state-of-the-art and user-friendly—controls were kept to a minimum, reflecting the demands of mobile operation. Since then, numerous two meter mobile transceivers appeared on the market, flourished briefly, and disappeared. All sorts of crazy options such as remote control heads, continuously adjustable output power and umpteen-million scanning speeds had their day. Meanwhile, the 7400A performed yeoman service in four different cars without one day of downtime.

And yet . . . I found myself thinking how nice it would be to have something smaller under the dash that didn't use power-hungry TTL technology . . . that didn't have its display wash out in bright sunlight . . . and that would allow storage of a few memories, say just 10. About that time, the ads for the TM-221 caught my eye. Ten years to the month that I bought my 7400A, I departed a hamfest with a brand new TM-221 under my arm.

The photo of the TM-221A shows the simple control layout. Here is a package installable virtually anywhere in your car or shack! It measures 5½" x 1½" x 7½", and weighs a mere 2.6 pounds. But, at over 40 watts, there's plenty of punch in that box . . . more than enough for 90% of all mobile FM needs. Front panel switches and knobs adjust volume, squelch, power on, HI/LO power, and dial tuning. Additional pushbuttons select either memories or the VFO, input memory data, and allow high-speed tuning with the main knob in MHz steps.

Five more pushbuttons are located under the frequency display, tucked out of the way until needed. They are (in order): SHIFT (for repeater offsets), REV (to listen on repeater inputs), SCAN, CTCSS (selects receiver subtone frequency), and TONE (selects transmitted subtone frequency). That's it! No other buttons to push, dials to turn, switches to set . . . a piece of cake.

One handy feature of the TM-221A is automatic repeater offset selection, based on the current ARRL two meter band plan. As you tune up from 144 MHz, the "correct" repeater offset automatically kicks in, depending on your position in the band. For example, simplex operation is selected from 144 to 145.10 MHz. From 145.10 to 145.5, the transmitted signal will offset −600 kHz from the receiver frequency. Above 145.50, simplex operation is again selected to 146.00, where an offset of +600 kHz kicks in. The procedure is repeated for all segments through 147.99 MHz.

In everyday use, you'll probably select favorite repeater or simplex frequencies that are stored in memory positions 0–9. Each channel stores not only the frequency, but offset, subtone and tone squelch information as well. In virtually all cases, 10 memories are more than adequate for normal operation. The TM-221A, however, also has 4 additional positions that are special function memory channels. Labeled A–D, these store upper and lower band limits for scan functions as well as non-conventional repeater offsets.

Kenwood kept the scanning functions simple as well. There are only two modes, (all that are usually necessary): Programmable Band Scan, where the upper and lower limits of the scan are entered into memories A and B, and Memory Channel Scan. One scan feature gaining popularity is channel lock out in a memory channel scan. Kenwood includes it here.

The supplied microphone is the MC-48 TouchTone microphone, that looks like a black version of the MC-46. One nice variation from the older MC-46 is that the PTT line must be keyed in order to transmit tones. On older microphones, the keypad was always active, and merely squeezing the microphone tightly often resulted in very interesting transmissions.

TM-221 Manufacturer's Specifications

Specification	Manufacturer's Claim	
Frequency Range	(Transmit)	144.000–148.000 MHz
	(Receiver)	138.000–173.995 MHz
Power Output	High	45 Watts
	Low	5–30 W adj.
Current Drain	TX High	9.5 A
	RX Squelched	0.4 A
Receiver Sensitivity	(0.16 µV for 12 dB SINAD)	
Receiver Selectivity	−6 dB/>12 kHz	−60 dB/>26 kHz
Audio Output	5% distortion	> 2 watts @ 8Ω
Weight	1.2 kg (2.6 lb)	

Performance

I spent almost three hours installing the radio in a 1987 Toyota Corolla LE in an attempt to create a low-profile and safe installation. The final resting place is inside a

continued on p. 20

73 Review *by Robin Rumbolt WA4TEM*

The CES 510SA-II Enhanced Telephone Interconnect

A solid 4-in-1 controller.

Communications Electronics Specialties, Inc.
931 S. Semoran Blvd.
Suite 218
Winter Park, FL 32792
(800) 327-9956
Price: $583

The CES 510SA-II is an automatic microprocessor-controlled telephone interconnect (autopatch) that provides telephone access to mobile and portable radios operating in simplex, half-duplex, and full-duplex modes (see sidebar for explanations of these modes). But it's more than an autopatch. With built-in ID capability, it can operate as a repeater controller, and has provisions for limited remote control of external devices as well.

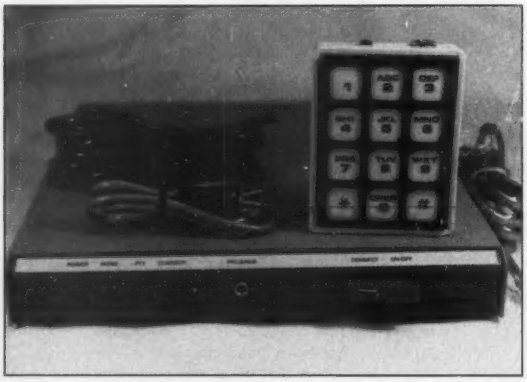


Photo A. View of the Smartpatch II with enclosed DTMF encoder and hookup cables.

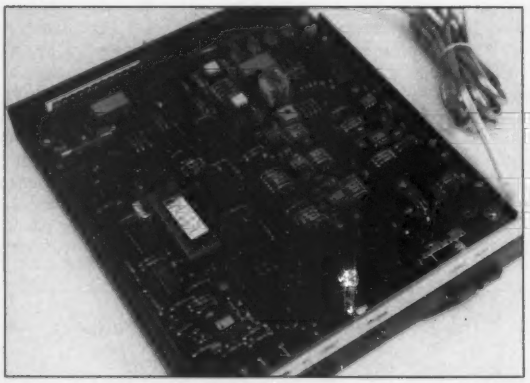


Photo B. Inside view of Smartpatch II.

Out Of The Box

The first thing I learned about the **Smartpatch II** was that you have to be careful not to drop it when you open the shipping box, or you could be limping around for a while. It's enclosed in an expensive looking 16 gauge steel cabinet that weighs almost four pounds!

Also packed with the interconnect, I found a DTMF (Touchtone) encoder for programming the unit, three cables, and a 27-page manual marked "**Preliminary**" that had a picture of an earlier version patch on the front cover.

After unpacking, I immediately grabbed a screwdriver and took the cover off the patch. You need to do this to make the connections since there are no rear panel connectors. You have to run the connecting cables through a cutout in the rear panel to a screw terminal block inside the unit.

Inside is a well laid out, double-sided circuit board with a lot of trimmer potentiometers and jumpers. More about those later. There was no silk screen on the board, but various components were identified by lettering etched in the copper itself. I found it interesting that none of the ICs were labeled. (U1, U2, etc.) The manual, however, has a parts layout diagram that serves this purpose.

I always like to look at the bottom of boards for "OPS" components and jumpers. These usually are extra parts added to correct problems found after the PC board has been made. There was one jumper and seven components on the bottom of this board.

The front panel of the interconnect sports four indicator LEDs—POWER, NOISE, PTT, and CONNECT—and two push button switches, POWER and CONNECT. The PROGRAM jack in the center of the front panel accepts a DTMF programming pad connection. See Photo A.

The Circuit

The brain of the CES 510SA-II is a MOSTEK 38P70 microprocessor. This is a piggyback type of micro in which the program ROM plugs directly onto the top of the microprocessor itself. It's an expensive way to go. This minimizes board space and complexity, however, and eliminates several memory interface components. Also, it makes it easy to upgrade software later. A watchdog timer automatically resets the processor should some type of glitch send the processor wandering off into never-never land. There is also a Power-On Reset (POR) circuit to get the micro started properly when power is applied.

Customer programmed parameters are stored in an 8 pin, XICOR 2404-type 512 byte EEPROM. This EEPROM can hold data even with power removed, and can be easily erased and reprogrammed electrically without using ultraviolet erasers and expensive EEPROM programmers.

The Smartpatch II uses the powerful CMOS chip, the MITEL MT8880 DTMF transceiver, for decoding and generating touchtones (DTMF). It has an onboard call progress tone filter which detects various phone line signals, such as dial tone, busy signals, etc. It also has a microprocessor bus interface. Quite impressive for a 20 pin chip! The 510SA-II uses all of these features.

The phone line interface consists of a hybrid transformer coupler circuit for full duplex operation. The traditional holding coil is replaced by a three-transistor current sink circuit. Optically isolated ring detection and "off hook" detection circuits are included. Diode bridges eliminate polarity sensitivity when connecting

continued on p. 35

GET YOUR BEARINGS STRAIGHT

At last! A map dedicated to the radio amateur. Announcing the **Azimuth-Equidistant** wall map from the Great Circle Map Co.

An azimuth map provides information about heading and range to any place on Earth. No longer will you have to guess at which way to aim your beam antenna for that rare DX.

Each map is specially drawn with your station at the exact center. The rest of the world is spread out around you. To use the map, simply find the target station and read the compass heading from the border of the map. To find the range, count the number of rings from the center. Each ring is spaced 1000 miles apart. Voila! You now know the true heading and range to the target station.

The maps are custom drawn with computer accuracy for your location and are personalized with your station's call sign at the lower right. Each map measures 35"x23", is brightly colored, and is printed on high quality poster stock making it suitable for framing.

To order, send $39 check or money order and your station's call sign and location (if you live in a large city, state which side of town) to:

Great Circle Map Co.
P.O. Box 691401 • San Antonio, TX 78269

DEALER INQUIRIES INVITED

CIRCLE 346 ON READER SERVICE CARD

gms 403

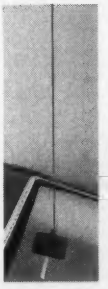
FOUNTAIN of YOUTH for NiCad BATTERIES

- Automatically erases memory and rapidly charges NiCad batteries up to 15 Volts.
- Allows batteries a long life with maximum capacity.
- Helps restore a tired battery.
- Full 2 year warranty.
- Cost effective, saves money.
- Ponce de León never had it so good.

Control Products Unlimited, Inc.
5 Somerset Dr., Coatesville, PA 19320
(215) 383-6395

Look at our MOBILE MARK "ON WINDOW" Line

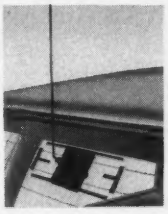
PATENTED



VHF (140-175)
- *No Hole*
- *Easy to Mount*
- *Rugged*
- *Superior Performance*
- *Radiator Snaps On and Off*
- *Competitively Priced*

UHF (420-520)
- *3 db gain*
- *No Hole*
- *Easy to Mount*
- *Rugged*
- *Superior Performance*
- *Radiator Snaps On and Off*
- *Competitively Priced*

Cellular/Trunking (800-895 MHz)



- *3db Gain*
- *No Hole*
- *Easy to Mount*
- *Rugged - Goes through Car Wash Without Removal*
- *Superior Performance*
- *Broad Bandwidth*
- *Small Size*
- *Competitively Priced*

MOBILE MARK, INC. COMMUNICATIONS ANTENNAS

3900-B River Road
Schiller Park, IL 60176
312-671-6690

brings imagination and innovation to antennas ..... and has been since 1948 !!

CIRCLE 163 ON READER SERVICE CARD

NOW HEAR THIS

FINALLY! High-Powered Sound from your HT.

- 10 DB of Audio Gain
- 3.5 inch Oval Speaker
- Automatic Shut-OFF
- Internal NiCad Charger
- External Power 5-15 VDC

$29.95

Model HTS-1

Naval ELECTRONICS INC.
5417 Jet View Circle, Tampa, Florida 33634
Phone: (813) 885-6091 Telex: 289-237 (NAVL UR) Fax: (813) 885-3789

CIRCLE 349 ON READER SERVICE CARD

We go to great lengths

...with our design and engineering. The HR 2510 is a full featured 10 meter mobile transceiver. You get all of 10 meters—from 28.0000 to 29.6999 MHz. You also get a full complement of operating modes (CW/SSB/AM/FM), and enough power to do the job, with 25W PEP for CW and SSB modes, and 10W for AM and FM. A built-in Digital VFO (tuned with a knob, *not buttons*) with steps of 10 KHz, 1 KHz, and 100 Hz, and Digital Display of your selected transmit frequency makes it easy to use.

...to make operation easy. We haven't neglected the receiver either. With typical sensitivity of only .25 μV for 10 dB S/N in CW and SSB modes, the HR 2510 has the extreme sensitivity needed for operation with less than ideal mobile antenna systems. There's also a highly effective switchable Noise Blanker for the ultimate in mobile ignition noise suppression. You also get receive scanning, (scan fifty 10 KHz channels), and RIT (Receiver Incremental Tuning) to precisely zero beat on your receive.

...with lots of standard features. Of course, an easy to read multifunction LCD display with selectable dim or bright backlighting, multifunction metering on the LCD with S/RF, Modulation, SWR Cal, and SWR functions, RF Gain control,Frequency Lock, and Channel Up/Down switches on the PTT microphone are all standard features.

...to make the President HR 2510 the best 10 Meter Mobile Transceiver on the market today.

President is a leading manufacturer of transceivers, and we've put that know how to work in the HR 2510 to bring you the finest 10 meter mobile in its class.

PRESIDENT

For more information on the President HR 2510, please write to:
President, 4700 Amon Carter Boulevard, Fort Worth, TX 76155
Attn: Literature Department (Amateur Radio)

CIRCLE 287 ON READER SERVICE CARD

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 30 PETERBOROUGH, NH 03458

POSTAGE WILL BE PAID BY ADDRESSEE

73 AMATEUR RADIO

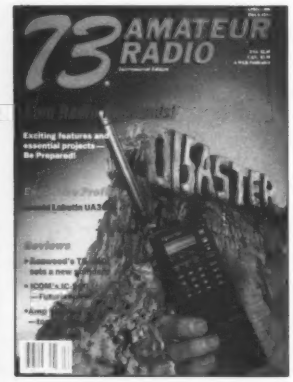
CIRCULATION DEPT.
WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

Place
Stamp
Here

73 AMATEUR RADIO

CIRCULATION DEPT.
WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

☐YES, I could use a little excitement in my hobby!



SPECIAL OFFER!

Send me 12 issues of *73* for the low subscription price of $19.97: save over $15 off the cover price! (Reg. sub rate: $24.97)

NAME _____ **CALL** _____

ADDRESS _____

CITY _____ **STATE** _____ **ZIP** _____

☐ **AE** ☐ **MC** ☐ **VISA** ☐ **Check Enclosed** ☐ **Bill me**

Card# _____ **Exp. Date** _____

Special offer on Foreign Rate! **Canada/Mexico $27**
Foreign Surface $27–1 year (12 issues) **(US funds)**

Call toll free 1–800–722–7790

Please allow 4–6 weeks for processing of first issue. Offer valid for a limited time only.

(Reg. sub rate: $24.97)

48N5

FEEDBACK

The Pitch: *73* wants to know what you want to read. Help us by voting on this month's features and columns—you'll find their numbers in the Feedback box on the page preceding this card.

The Payoff: Each month we'll draw a card at random. If yours is picked, you'll receive a one-year subscription (or extension) to *73*.

Article #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Great																									
OK																									
No Way																									

Article #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Great																									
OK																									
No Way																									

Name _____

Address _____

City _____ State ____ Zip _____

I'd like to see more _____

I'd like to see less _____

48N0

FEEDBACK

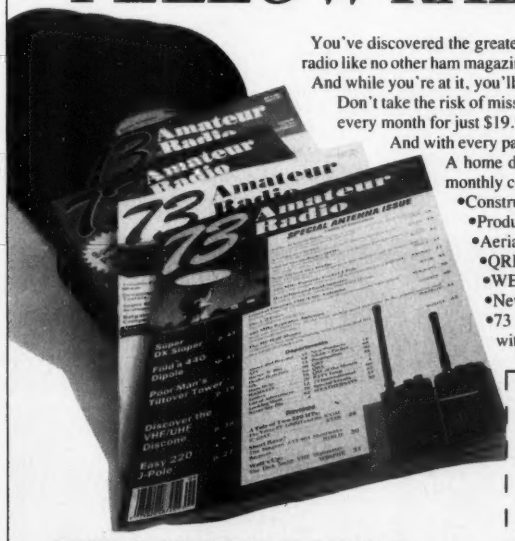
In our continuing effort to present the best in amateur radio features and columns, we've decided to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed below. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we'll draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save some money on stamps, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback#	Title
1	Welcome, Newcomers
2	Never Say Die
3	QRX
4	Homing in
5	Review: Kenwood TM-211A
6	Review: CES 510SA-II
7	Review: Raise the Hazer!
8	All About Henry
9	Review: Maggiore Hi Pro Basic Repeater
10	Lap Top Repeater Controller
11	Book Review: Wishbook of Circuits
12	Kenwood 4100A
13	Review: RF Concepts Model 3-312
14	Ultimate Repeater Controller
15	Computerized Tuning
16	Review: LF Engineering Receiving System
17	Life of a Megacycle
18	Hamsats
19	Propagation
20	Review: Nye-Viking Antenna Matcher
21	Review: Orion ½ wave HT whip
22	New Products
23	Tech Tips
24	DX
25	Aerial View
26	Ham Help
27	QTH DX
28	Special Events
29	ATV
30	Looking West
31	Barter N Buy
32	Ad Index
33	Index: 11/88
34	Letters
35	73 International
36	Dealer Directory
37	QRP

FELLOW RADIO AMATEURS,



You've discovered the greatest hobby in the world. And *73 Amateur Radio* captures the excitement of amateur radio like no other ham magazine in print today. With *73*, you'll have *fun* discovering the thrills of this great hobby. And while you're at it, you'll also learn more about ham radio.

Don't take the risk of missing out on all *73* has to offer. You can have your issue of *73* delivered to your home every month for just $19.97 (12 issues)—that's 43% off the cover price!

And with every paid subscription we'll send you a FREE GIFT: a great looking *73* baseball cap.

A home delivered copy of *73* means you'll never miss out on these tremendously popular monthly columns:

- Construction projects: The most homebrew projects *anywhere*.
- Product reviews: Belly-to-belly matchups of new gear.
- Aerial View: Everything you'll ever want to know about antennas.
- QRP: For low power aficionados.
- WEATHERSATS: Get the latest fax on the weather.
- Never Say Die: And you bet I won't.
- 73 International: *73 Amateur Radio* is the only ham magazine with monthly news from every corner of the world.

SUBSCRIBE TODAY.

And remember—with every paid subscription order, you'll receive a FREE *73* BASEBALL CAP, and SAVE 43% OFF THE COVER PRICE!

☐ YES! I want to receive my copy of *73 Amateur Radio* at home every month. Please start my subscription immediately: 1 year (12 issues) for $19.97 and a FREE *73* BASEBALL CAP!*

Name _____

Address _____

City _____ State _____ Zip _____

☐ Bill Me ☐ Check Enclosed ☐ Charge my credit card

Account # _____

☐ MC ☐ Visa ☐ Amex Exp. Date _____

Signature _____

Offer valid for a limited time only. Canadian and foreign surface orders: $27 per year (12 issues) U.S. funds. Please allow 4–6 weeks for delivery of first issue. *Free gifts are send to paid subscribers only.

Mail Coupon to: *73 Amateur Radio*, P.O. Box 58866, Boulder, CO 80322-8866 58N2

Homing In

Track down one of amateur radio's hottest pursuits!

Joe Moell, P.E., KØOV

Do you think you've done it all in ham radio? If you've never been on a hidden transmitter hunt, you may have missed some of the greatest excitement a ham can have.

This column will help you get in on the fun.

Radio direction finding (RDF) has been around about as long as radio itself. At the turn of the century, Hertz and Marconi developed directional antennas to funnel signals longer distances. Then they discovered that they could use these antennas to determine the direction of incoming signals. RDF pioneers, such as Bellini, Tosi, and Adcock, soon developed specialized receiving antenna systems that gave even more accurate directional indications.

In its infancy, RDF was used as a navigational aid. A ship's operator took bearings of known shore stations to determine their own location. During World War I, RDF techniques were used for the first time to locate clandestine transmitters, in this case, of enemy ships.

This second kind of RDF is what most hams are interested in. For forty years or so, hams have held hidden transmitter hunts. One or two hams take a station to an unlikely spot and make continuous or intermittent transmissions. Usually, they remain stationary. The hunters, as individuals or in teams, do their best to home in on the transmitter with their direction-finding equipment.

The goal is either to be first, or to drive the least miles, depending on the rules of the hunt. While there are occasional all-on-foot events, most hunts in the US involve—RDF-equipped cars, trucks, vans, and even motorcycles. Occasionally, at the end of the hunt, you have to go on foot to sniff out the concealed transmitter.

Nomenclature

As a sport, RDF is usually called "foxhunting" by amateur radio magazines in this country, since that's what it's called on the east coast and in Europe. It's written as one word. In a few places, you may hear of "bunny hunting" instead.

Searches for unlicensed stations, or stations which are causing malicious interference, have been dubbed jammer hunts, turkey hunts, or maverick hunts in the ham press. In southern California, we call all RDF work "T-hunting." The hider is the "hidden T."

Sport RDF is an adventure for the hunters, but it's even more of a challenge for the hider. His goal is to select a combination of location and antenna that will make it difficult for hunters to get reliable bearings. Like a good ventriloquist, he tries to "throw his voice" and make the signal appear to be coming from some other location. Perhaps he will camouflage the setup so well that the hunters won't know that they've found the transmitter unless they literally trip over it.

When you compete in a QSO party or DX contest, you don't know who your competitors were or how well you did until months later. But when you go T-hunting, you know whom you're up against, and usually how well you placed before you go home. After every hunt, you'll find a lively postmortem session with plenty of success and failure stories, either at the hunt location or a nearby restaurant.

Olympic-Style Foxhunting

Just like amateur radio itself, transmitter hunting is a worldwide pastime. In Europe, you have to be an athlete to successfully compete because all the hunting is done on foot. Using hand-held gear, the hunters race off to locate several well-concealed transmitters, each synchronized to go on and off in sequence. The hunters can use maps and compasses in addition to their DF gear, but they can get no other help.

Local, regional, and national DF events in Scandinavia and eastern Europe lead to the IARU Region 1 championship competition, which has all the trappings of the Olympics. There are receptions, banquets, speeches from government officials, and radio and TV coverage. Hunts for prize medals and trophies are held on both 80 and two meters in separate categories for men, women, boys, and teams.

Up to five foxes are scattered on a course several miles long. Hilly, wooded terrain is often selected. Starting times are staggered to force the hunters to work independently, and judges patrol the hunting grounds. Winning times are in the order of 45 minutes.

On the other side of the world, direction finding has become an important athletic competition in the Peoples Republic of China. A national competition brings out the best Chinese hunters and guest competitors from neighboring countries, such as Japan. Rules are similar to European championships, with one interesting variation: Before the hunt, each contestant takes a written exam on basic electronics, transistor circuits, and direction finding. Each point scored in the exam gives the hunter a one-minute credit against his elapsed time in the hunt.

RDFing in America

T-hunters in the US love to have fun, but they're unique because they can and do use their skills for more serious purposes. RDF plays an important part in self-policing amateur radio. Local Interference Committees, part of the ARRL Amateur Auxiliary program, are empowered to solve many ham-to-ham interference problems by peer pressure and jawboning. In an increasing number of areas, there are standing agreements between the Auxiliary and local FCC offices which permit volunteer ham DFers to gather evidence leading to prosecution in serious cases of malicious interference.

Photo A. Every hunter has his own favorite system. At this All Day Hunt start, two teams are using very long yagis. (Photo by Tom Curlee WB6UZZ.)

Photo B. Without accurate map work, a hunter can put on lots of unnecessary miles. Kuby N6JSX ocasionally takes time out to carefully plot his bearings. (Photo by Tom Curlee WB6UZZ.)

Photo C. It isn't enough to have a good vehicle setup in Southern California. You also need to be able to hunt on foot. Here, Clarke WB6ADC makes final adjustments to the hidden transmitter before covering it with brush. (Photo by Tom Curlee WB6UZZ.)

T-hunters can also serve the public by participating in search and rescue activities. DFers working with agencies such as the Civil Air Patrol and the US Coast Guard Auxiliary have helped save the lives of victims of air crashes and boating accidents.

Southern California brazenly lays claim to the title of "T-hunting Capital of the USA." There are close to a dozen competitive hunts scheduled each month in Los Angeles and Orange counties, with plenty of hunters every time. There are also hunts in the Santa Barbara and San Diego areas, and hunts are getting organized in western Riverside county.

Most hunts are on two meters, but there are monthly hunts on 28, 50, and 223 MHz. All hunts are on Saturday or Sunday, daytime or evening. For a list of the regular Los Angeles and Orange County hunts, send me an SASE.

The varied terrain of Southern California adds excitement to T-hunting. Most hunt boundaries include the flatlands of urban Los Angeles and Orange County, plus the Chino and Puente Hills, some of which are over 1000 feet high. The boundaries of the four monthly two meter Saturday night hunts are all different, encompassing areas ranging from 78 to 2320 square miles. The hidden T could be 50 miles away on these hunts.

The most challenging hunt of all is called the All Day Hunt. But that's a misnomer—it should be named the All Weekend Hunt. It's held at least four times a year, starting at 10 AM Saturday from the top of Rancho Palos Verdes. The rule is that the transmitter can be anywhere in the continental USA!

Hiding spots for the All Day Hunt have ranged from the Salton Sea, 228 feet below sea level, to mountain peaks 8000 feet high. It's not unusual for the hidden T to be in a location such as Death Valley, over 200 air miles away. To provide a deceptive two meter signal back to the starting point, All Day Hunt hiders come up with very unusual transmitting setups. This year in May, K6KYW and N6JF used a 35-element yagi antenna with a 100-foot long boom!

Of course, there are transmitter hunts going on all over the US. In the past few years, I've had the chance to talk to hunters in diverse cities, such as Chicago, Phoenix, Daytona Beach, and Boston. All these groups have two meter hunts, but they all do them a bit differently. Some run the hunt like a rally, requiring the winner to have lowest mileage. They say it discourages reckless driving, encourages careful triangulation, and evens out the competition. Sometimes the last team to arrive is the winner in a mileage hunt.

Other groups use time as the winning criterion. They say that time is of essence in a jammer hunt or search-and-rescue operation, so hunters must learn to find transmitters fast. Furthermore, in a time hunt there is no need to worry about the accuracy of competitors' odometer readings.

In some places, hunts for multiple transmitters are common. In others, one well-concealed rig is enough. Some hunts have strict rules about antenna polarization, power variations, and nearness to paved roads. Others say, in effect, "Anything goes!" Most of the time it's "Every team for itself," but in a few towns there are cooperative hunts on repeaters, and bearings from base stations are welcome.

Who can T-Hunt?

Transmitter hunting belongs in the mainstream of amateur radio. Going on a hunt is just as exciting as working a new country. DF setups can be just as high-tech as a packet network or as simple as a Novice station. An informal hunting group can build friendships as well as a formally chartered radio club. Ham RDF can be used for public service and saving lives.

When you've worked that last country you needed to get on the DX Honor Roll, and you think the challenges are behind you, don't wait for the ARRL to invent more countries. Build your own RDF gear (it's not hard; most hunters build some or all of their DF gear), put it in your car, and go on a competitive transmitter hunt. A T-hunter is never able to say he's done it all, because some hider will always be able to find a new way to confound him.

Drop Me a Line!

There are a number of other considerations for developing hunt rules, which will be discussed in future columns. This is where you come in. I want you to share what hunting is like in your area. Are there lots of small hunts, or a few really big ones? Do the local hunters prefer time hunts or mileage hunts? Continuous or intermittent signals? Sniffer hunts or on-the-road hunts? Night or day? Which bands are popular? What kind of hunting equipment predominates? Who is your local "T-hunt guru?" Would you support a national T-hunt championship? Let's make this column a forum for a fascinating aspect of amateur radio! Tell me what's going on in your area, and what you'd like to see in this column. Write to me at PO Box 2508, Fullerton CA 92633 (SASE appreciated if you want a reply), or send a message to 75236,2165 on CompuServe.

Remember, you can T-hunt even if you don't have your license yet. All you need to start is a receiver and a directional antenna system. There may be a hunt in your area this weekend. Find out, and if there is, give it a try! 73

New columnist Joe Moell KØOV has been an avid ham since the age of 11 and a transmitter hunter almost that long. When not T-hunting with his wife, April WA6OPS, he supervises the design of radar transmitters at a Southern California aerospace company. Joe is a Registered Professional Engineer in California. He co-authored, with Tom Curlee WB6UZZ, the book *Transmitter Hunting: Radio Direction Finding Simplified*, a 323-page illustrated T-hunting handbook available from Uncle Wayne's Bookstore.

Hazer

Continued from page 11

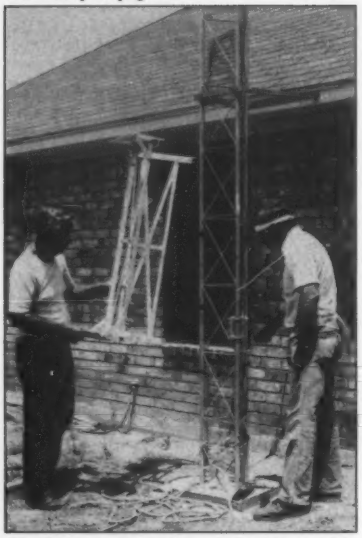


Photo C. Winching the the two Hazer side parts above the house bracket.

Photo D. Final bolt tightening before antenna installation and raising.

Actual operation depends on tower guy wire arrangement. All installations should be guyed, wherever possible. There are two methods of tower-end guy wire attachment: (1) tower top (apex) attachment in a conventional manner, or, (2) attached to the top or bottom Hazer main frame by use of the lugs in the kit. When using the Hazer with a conventional tower attachment, temporarily disconnect the two guy wires to allow long beam elements to pass and reconnected for "insurance" as the assembly is completely lowered. When used with Hazer attachment, loosen guy wires only enough to raise the assembly, thereby allowing you to release the safety latch. Remove lower level guy wires, such as those used for 60′ towers, to let the Hazer pass. Tag lines (short, lightweight rope), tied to the anchor end of each low level guy wire, can be used to retrieve the guy wires when the Hazer assembly is raised to its operating position.

Conclusion

We have had no troubles with our unit whatsoever. I've spoken with several local Hazer users and they all concur—they've had no troubles with theirs and are delighted with not having to climb their towers to work on antennas! They also concur with this one regret: They hadn't bought the Hazer sooner.

All Hazer kits include all hardware, 1000 pound manually operated winch, 100′ of wire rope, top pulley assembly and an instruction sheet. The complete "GME" product line is available in a neat 15-page catalog. Only two pages are used to detail GME products, the remaining pages include specifications, drawings, typical guy wire layouts, photographs, a USA Wind-Pressure-Map, and, of course, an order form with shipping and purchase information. If you contact them directly, please mention where you saw it, and who sent you!

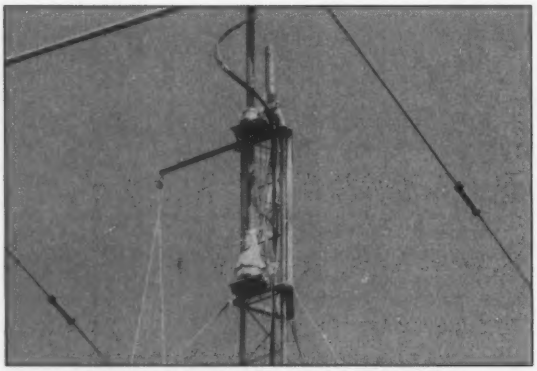


Photo E. The Hazer in action at the top of the tower.

Caution:

Safety of all personnel, equipment and real estate is of utmost importance during any antenna work. It is the responsibility of the installer and/or user to exercise all safety precautions at all times. It may be necessary to obtain professional engineering assistance to insure an installation that complies to good engineering practice and with local and national codes.

Kenwood

continued from p. 13

detachable change tray just behind the shift lever. Bear in mind my performance evaluation is based on user observations, not on bench tests.

In every case, the TM-221A's receiver was as sensitive as the older TR-7400A. Selectivity was at least on a par with the '7400. The RF amplifier is a 3SK184 GaAsFET, with a bandpass filter in front and a 3-section Hi-Q bandpass filter following (essentially a helical resonator circuit). The output drives another 3SK184 acting as a mixer. Two stages of crystal filtering are used at the first IF (10.695 MHz), and another monolithic filter is used at 455 kHz.

What makes it all work is the Hi-Q filter and bandpass filter around the first RF stage, since most of the "garbage," such as IMD products, issues from there. Suppressing out-of-band signals to limit compression of the front end goes a long way towards helping you hear that distant repeater! This is a lesson learned the hard way by Kenwood and other manufacturers based in Asia, where RF pollution in heavily-populated areas can be nothing short of astonishing.

The transmitter lineup is fairly conventional. It uses an M57726 hybrid power module with four poles of bandpass and low-pass filtering. Full ALC protection is offered and the low-power output is continuously adjustable from 0–30 watts. High power out claim is 45 watts; I found it at closer to 40. This is largely a function of (1) How long the DC leads to the battery and (2) How heavy a cable is used. The DC leads supplied with the TM-221A are a bit light for nearly 90 watts of DC input, so you may wish to use heavier wire for long runs.

In mobile use, the TM-221A is a piece of cake. The amber backlit LCD display should be mandated for EVERY piece of electronic gear installed in a car. It is equally readable at night or in bright sunlight, unlike the conventional green displays. The display indicates the frequency (or memory channel) in use, selected offset, tone/CTCSS enabled, scan mode, signal strength and power output. Simple enough!

QSY is fast, and even easier when selecting memory channels. One obvious drawback of such a small package is the size of the control buttons! You must be careful not to brush keys when reaching over to make a channel change. An example is the position of the HI/LO power switch adjacent to the POWER ON switch. I invariably punch up low power when turning the radio on.

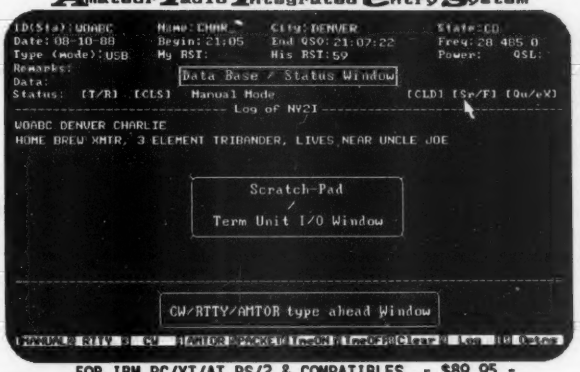
Conclusion

I highly recommend the TM-221A for both first-time buyers and seasoned 2 meter FM veterans. It is easy to use, offers just the right amount of features and fits nicely inside today's automobiles with limited dash space. Receiver performance is superior in high RF environments (a selling point I cannot stress enough) and the output power is just right for all kinds of mobile work. Besides . . . it looks great under the dashboard!

Aries—1

Amateur Radio Integrated Entry System

ALL MODE SOFTWARE



FOR IBM PC/XT/AT PS/2 & COMPATIBLES - $89.95 -

Aries—1...

... Inserts DATE / TIME from **Computer** - FREQUENCY / MODE from **Transceiver** (certain **Kenwood** and **Icom** models) into log.
... Interfaces with **Kantronics KAM** and **AEA PK-232 Terminal Units** for totally integrated ON-SCREEN I/O.
... Works with a Mouse and/or Function Keys for fast and easy control of Terminal Units and Data Entry.
... **Is useful with or without interfacing to Terminal Units and Transceivers.**
... Changes TU Modes, operating parameters and files data into the Log file with the press of a key or the click of a mouse.
... Has a **Contest Mode** and automatic string replacement capability which give new meaning to quick exchanges.
... Has Automatic **Dup checking** and the ability to search / print data base by Call, Country, Freq, QSL info, etc.
... Lets you run other programs (or access DOS) while staying resident in memory along with your data.
... Logs voice contacts, while simultaneously connected to a packet mail box and down-loading messages into a capture file.

An Extremely useful program! Most Aries-1 Users "fire up" the program whenever they are in the shack. Whether operating Voice, AMTOR, Packet or any other mode, you will enjoy having your Log available on screen simultaneously with your Terminal Unit and access to your other ham software just a keypress away.

VISA -- Our 10th Year of delivering Quality Software to the International market -- MasterCard

ashton ITC

PO Box 1067 - Vestal, NY 13851 - (607-748-9028)

CIRCLE 338 ON READER SERVICE CARD

PACKET RADIO SOFTWARE

FOR COMMODORE 64 / 128 COMPUTERS

PACKET TNC INTERFACE PROGRAM ($34.95)

TNCLINK-64/128 provides a menu-driven operating environment for Packet Radio operation of any TNC requiring external software. FAST Machine Language program is more than a terminal emulator. Features include:

- Computer data transfer rates of up to 1200 baud
- User defined split-screen size and colors
- Complete Disk and printer support
- Operating setups can be saved on disk
- Ten 256-character message buffers
- 8192 character receive and transmit buffers

PACKET NETWORK MAPPING PROGRAM ($29.95)

PATHFINDER-64/128 monitors a Packet frequency and forms a table of all active paths between stations heard. Up to 128 calls are stored in a table which can be saved on disk. This allows you to quickly find the best paths to use for accessing stations. Features include:

- Find all stations and digipeaters available to you
- Find one or two digipeater paths between stations
- Highlight stations used as digipeaters
- Print lists of calls, paths, or digipeaters

WRITE FOR MORE INFORMATION

Terms: To order send check or Money Order. Money back guarantee. Mass. residents add 5% sales tax. Add $2.50 shipping per order.

ZELTWANGER ELECTRONICS
P.O. BOX 4995
NATICK, MA 01760

CIRCLE 351 ON READER SERVICE CARD

313-469-4656

28360 South River Rd.
Mt. Clemens, MI 48045

Michigan Radio

SALES SERVICE

WE NOW HAVE

*ALL PRICES SUBJECT TO CHANGE

ICOM		LIST	OUR$!
IC-781	NEW super deluxe general cvg MOST ADVANCED RIG OUT!!!	5995.00	5899.95
IC-761	Delux gnrl cvrg xcvr/ps/at excellent gnrl cvg rig	2699.00	2314.95
IC751A	Gnrl cvrg xcvr/keyer/cw fltr DXpedition Proven!!!	1699.00	1454.95
IC-735	Gnrl cvrg xcvr/DSP/compact Big performance/small size!	1099.00	944.95
R-71A	Hi performance receiver The DXers Choice!!!	999.00	859.95
R-7000	25-2000 mHz scanning rcvr The Super Scanner!!!	1199.00	1029.95
IC-27A	25w 2m mobile xcvr/DTMF mic	429.00	369.95
IC-27H	45w version of above	459.00	389.95
IC-37A	25w 220 mobile with DTMF mic	499.00	424.95
IC-47A	25w 440 mobile with DTMF mic	549.00	469.95
IC-28A	Compact 25w 2m mobile/DTMF mic o-s-i-s-n-d-s-d rx coverage!	489.00	404.95
IC-28H	45w version of above	489.00	429.95
IC-38A	Compact 25w 220 mobile/DTMF	499.00	414.95
IC-48A	Compact 25w 440 mobile/DTMF all of these ICOM VHF/UHF rigs INCLUDE THE CTCSS (PL)!!!	509.00	439.95
IC-471A	All mode 70cm xcvr PRICED TO CLEAR THEM OUT!	1049.00	809.95
IC-275A	Deluxe all mode 2m/ps/25w ICOM'S latest all mode!!!	1299.00	1114.95
IC-275H	NEW 100w 2m all mode w/ps The Grid Square Getter	1399.00	1199.95
IC-375	NEW 220 all mode/25w/ps Another first from ICOM!	1399.00	1199.95
IC-475A	NEW 70cm all mode/25w/ps	1399.00	1199.95
IC475H	NEW 100w 70cm all mode/ps The biggest gun for UHF!	1599.00	1374.95
IC-900	NEW remote control multi-band FM xcvr. NEAT!!!	639.00	549.95
IC-2AT	1.5w 2m synthesized HT The IC-2AT has been in production longer than any other HT produced for the Ham market. Time tested, tried and true!!!	319.00	274.95
IC-3AT	220 version of IC-2AT	349.00	299.95
IC-4AT	440 version of IC-2AT	349.00	299.95
IC-02AT	2m HT/10 mem/ctcss/DTMF 5 watt version w/BP7	409.00	349.95
IC-03AT	2.5w 220 HT/ctcss/DTMF Great for novices!!!	449.00	389.95
IC-04AT	3w 440HT/ctcss/DTMF Get away from the crowd—go 440!	449.00	389.00
IC-u2AT	Micro 2m ht/ctcss/DTMF/mems	329.00	289.95
IC-u4AT	Mini 440 ht/ctcss/DTMF/mems Looking for a small ht with big features? Check out the ICOM MICRO line hts.	369.00	319.95

WE STOCK A FULL LINE OF ACCESSORIES FOR THE ICOM LINES.
CALL FOR INFORMATION, RECOMMENDATIONS AND OUR DISCOUNTED PRICES!!
(313) 469-4656

KENWOOD		LIST	OUR$!
TS-940s	Super gnrl cvrg xcvr. The Ultimate Weapon! w/at	2449.95	2074.95
	without at	2219.95	1879.95
TS-930s	Gnrl cvrg xcvr/ps/notch w/at DXcellence!	1199.95	1014.95
TS-440s	Compact xcvr/89 mems 102db dynamic range! w/at	1379.95	1168.95
	without at	1179.95	998.95
TS-140s	Compact gnrl cvrg xcvr DXciting price!!!!!	929.95	787.95

TS-680s	Compact gnrl cvrg xcvr WITH SIX METER COVERAGE!!!	999.95	929.95
R-5000	102 dB range SW receiver 100 Memory Channels!!!	999.95	815.95
R-2000	General coverage receiver 10 memories/2 clocks	749.95	610.00
TM-2530	25w 2m mobile/DTMF	479.95	405.95
TM-2550	45w 2m mobile/DTMF	499.95	419.95
TM-2570	70w 2m mobile/DTMF	599.95	505.95

POCKET HANDHELDS

TUE WEDS 10-6
THU FRI 10-9
SAT 10-4

KENWOOD		LIST	OUR$!
TM-3530	25w 220 mobile/DTMF Kenwood's 25/35 series radios are DCS/DCL compatable.	499.95	419.95
TW-4100	2m/440 dual band mobile	599.95	514.95
TM-721A	2m/440 deluxe dual band	699.95	589.95
TH-21BT	220 version 21BT	299.95	254.95
TH-41BT	440 version 21BT	299.95	734.95
TH-25AT	NEW MINI 2M SYNTHESIZED HT!!!	349.95	294.95
TH-205AT	2m 3w ht/3 memories Affordable HT!!!	299.95	249.95
TH-215AT	2m 3w ht/10 memories/ctcss	379.95	319.95
TH-315AR	220 3w ht/10 memories/ctcss	399.95	334.95
TH-415AT	2.5w 440 ht/10 meme/ctcss	399.95	334.95
TM-221A	45w mobile w/DTMF mic	439.95	369.95
TM-321A	220 version of 221	449.95	379.95
TM-421A	35w mobile 440 w/DTMF mic	449.95	379.95
TR-751A	2m all mode mobile	599.95	549.95
TS-711A	Deluxe 2m all mode w/ps	1029.95	869.95
TS-811A	Deluxe 70cm all mode w/ps	1229.95	1039.95

GO SATELLITE IN A BIG WAY - USE THE KENWOOD TWINS - T11/811!
WE STOCK A COMPLETE LINE OF KENWOOD, ACCESSORIES, RECOMMENDATIONS, AND OUR LOW PRICES 469-4656

TEN TEC		LIST	OUR$!
586 PARAGON	Super HF transceiver THE transceiver	2245.00	1924.95
561 CORSAIR II	HF transceiver	1445.00	1239.95
525D ARGOSY II	Economy HF transceiver	745.00	639.95
RX-325	Compact gnrl cvrg rcvr	699.00	574.95
2510	Satellite station	549.00	474.95

WE STOCK THE FULL LINE OF TEN TEC ACCESSORIES - CALL US FOR INFORMATION, RECOMMENDATIONS, AND OUR DISCOUNT PRICES!!!

YAESU		LIST	OUR$!
FT-767	Super xcvr/ps/at/mic accepts modules for VHF/UHF	1929.95	1684.95
FT-757II	New, improved version 757	1129.95	974.95
FT-747GX	NEW!! Economy HF XCVR	899.95	754.95
FT-736R	NEW!!! multimode VHF/UHF	1749.95	1499.95
FRG-8800	Gnrl cvrg rx/10 mems/key entry	799.95	684.95
FRG-9600	Scanning VHF/UHF receiver	699.95	494.95
FT-727RH	2m/440 ht NEW CPU! The first dual band HT!!!	439.95	359.95
FT-109RH	220 HT/5w/scanning/memories	399.95	329.95
FT-209RH	2m HT/5w/scanning/memories	399.95	329.95
FT-709RH	440 HT/5w/scanning/memories	399.95	329.95
FT-23R	Mini 2m HT/DTMF	334.95	289.95
FT-33R	Mini 220 HT/DTMF	399.95	329.95
FT-73R	Mini 440 HT/DTMF	349.95	319.95
FT-211RH	2m 45w autodialer mobile	449.95	389.95
FT-311RM	220 25w version FT-211RH	439.95	384.95
FT-711RH	440 35w FM autodialer mobile Limited number w/ autodial microphone	479.95	414.95
FT-212RH	High Tech 45w 2m mobile	459.95	399.95
FT-712RH	High Tech 35w 70cm mobile	499.95	434.95

Please note: the 211 series no longer comes from Yaesu with the autodial microphone. We have a limited number of them in stock with the autodial mic.

WE STOCK A COMPLETE LINE OF YAESU ACCESSORIES!
CALL US FOR INFORMATION, RECOMMENDATIONS AND OUR LOW PRICES!!!
(313) 469-4656

CIRCLE 162 ON READER SERVICE CARD

All About Henry

Accurately verify a wide range of inductances with this simple project.

by W.K. McKellips WB4DCV

I had tried building various inductance bridges in the past. Most of the designs worked well on the larger inductances, but are best described as flaky in the lower, microhenry ranges.

Having collected my share of small coils and chokes, I got fed up with buying a new coil for every project when I probably had three of that value in my junkbox. I wanted to measure the values of all those funny looking little lumps of wire, but I didn't want to pay $150 for an instrument to do so.

How about a kit? The July 1988 issue of *Radio Electronics* offered a solution: a build-it-yourself digital inductance meter designed by Neil W. Heckt. There was one drawback, however—the parts kit costs $149!

The Do-It-Yourself Approach

Finally, I read that story and examined the math behind the concept. The idea was delightful. All you needed was a programmable read-only memory (PROM) chip blasted with 16000 answers based on the formula. The rest of the thing was just an oscillator and a cheap frequency meter.

Well! I already had a frequency meter and a $1000 computer sitting around. All I needed was the oscillator. The formula could easily be incorporated into a simple BASIC program.

Circuit Components

The oscillator is ingenious. (See Figure 1.) It's an LM-311 voltage comparator IC connected as an amplifier with positive feedback. It's free-running, but controlled by the inductance/capacitance circuit connected to pin 2. The oscillator will work on almost *any* inductance/capacitance ratio. For that reason, it'll measure from 0.05 µH on up to at least 20 H, the biggest choke I had in my collection.

The only critical component is the 1000 pF silver mica capacitor C1. Capacitor C1 is large enough to more or less swamp out any stray capacity in the circuit. A silver mica generally rates at 5% tolerance, and has very low drift. That should get you an accuracy of about 5%. If you have an accurate capacitance meter, you can get C1's exact value, plug it into the program, and get even better accuracy.

I soldered it together on a Radio Shack Experimenter's IC Perfboard, (Cat# 276-150), that measures 2″ x 3″. This I installed in a Radio Shack Experimenter's Box, (Cat# 270-233), but I'm sure any small box would do. The binding posts again came from the Shack (Cat# 274-662).

Testing the Tester

After finishing the unit, I used a capacitor bridge to measure C1. The value read, in picofarads, was then plugged into the formula. It doesn't matter at all what value you use for the inductance standard LS because the BASIC program figures the value of LS automatically, and uses it for the calculation.

Very short wire runs between the tuned circuit and the binding posts helped keep stray inductance to a minimum. In my version, I found that shorting the binding posts kept it down to about 0.05 µH.

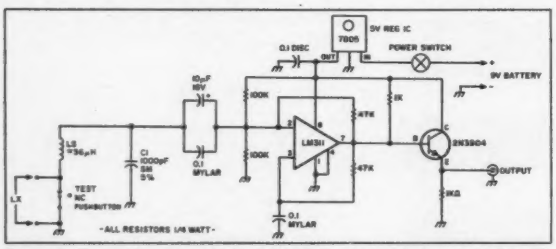


Figure 1. The oscillator circuit. Note the LC circuit attached to pin 2 of the IC. This circuit oscillates with a wide range of inductance/capacitance ratios.

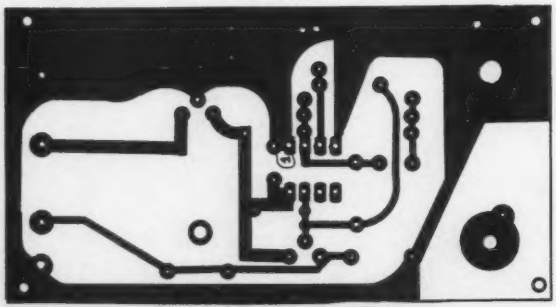


Figure 2. PCB foil for the oscillator.

Now You've Got It Made

Type in the BASIC program I've listed, and save it. Connect the unknown inductance to the binding posts. Turn on the power switch and let the circuit oscillate for a second or so to stabilize, then read your frequency meter for the first frequency: F1. It will be about 600–700 kHz. Write it down. Now push the TEST button and read F2 on your frequency meter. Write that down as F2.

Now run your computer program and enter the values of F1 and F2. Voila! There's the value of the coil on your computer screen.

You could probably modify the meter to figure unknown capacitance, but in my case, I already had a capacitance meter, and wanted to keep it simple.

So, go ahead and build something, have fun, and save a pile of money. I sure did!

```
                    Program Listing

10 REM ALL ABOUT HENRYS
20 REM 1ST FORMULA FROM AMATEUR HANDBOOK
30 C1 = 1000: REM C1 = 1000 UUF.
40 HOME : VTAB 8: PRINT "FREQUENCIES SHOULD BE
   IN KHZ.": PRINT
50 INPUT "ENTER FREQ #1 (XXX.X): ";F1
60 IF F1 = 0 THEN END
70 F1 = F1 / 1000: REM CONVERT TO MHZ FOR FORMULA
80 LS = 25330 / (C1 * (F1 ^ 2))
90 LS = INT (LS * 100) / 100
100 PRINT : PRINT "INDUCTANCE STANDARD: ";LS"
    UHYS": PRINT : PRINT

110 REM 2ND PART FROM JULY '88 RADIO ELECTRONICS
120 LS = LS / 1000000:F1 = F1 * 1000
130 INPUT "ENTER FREQ #2 ";F2: PRINT
140 IF F2 > F1 OR F2 = 0 THEN HOME : END
150 LX = ((F1 / F2) ^ 2 - 1) * LS
160 PRINT INT (LX * 100000000) / 100;"UHY."
170 IF LX < .001 THEN 210
180 PRINT INT (LX * 100000) / 100"MHY."
190 IF LX < .01 THEN 210
200 PRINT  INT (LX * 1000) / 1000"HYS."
210 PRINT : GET ANS$: PRINT : GOTO 130
```

Table 1. Program listing to use with the oscillator to calculate unknown inductances in coils.

Program Listing Notes

The program is written in Microsoft BASIC. See the program listing.

Line 30: Change the value of C1 if you have a more accurate reading for it.

Line 50: Input your frequency reading in kiloHertz, such as "645.5". You generally won't need to enter more than the first four figures.

Line 60: If you want to quit, enter "0" and the program will end.

Line 70: Converts kHz to MHz for the formula to work.

Line 80: This is formula #1 for figuring the standard inductance value, LS.

Line 90: This rounds off all the extra figures for a clean printout.

Line 120: Here we convert LS and F1 to work in formula #2.

Line 140: If you want to quit, or if F2 is larger than F1, the program ends. F2 will always be lower than F1 because you are adding inductance to the circuit in series with LS.

Line 150: Here's the second Biggie. This formula figures the value of the unknown inductor, using F1, F2, and LS.

Line 160 through line 210 print the value and offer you a chance for additional readings.

The program was written for an Apple II+ but it is so simple that you can probably easily translate it into other BASIC languages.

MADISON SHOPPER

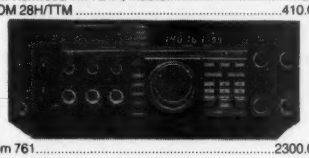
CALL FOR ORDERS
1 (800) 231-3057
1-713-520-7300 OR 1-713-520-0550
TEXAS ORDERS CALL COLLECT
FAX 1-713-771-7759

ALL ITEMS ARE GUARANTEED OR SALES PRICE REFUNDED

New Icom IC 781 ..... Trades wanted
Kenwood TH215A, TH25AT ..... Trade in your old HT
New Kenwood TM-621A, 144/220 MHz FM ..... Call

Kenwood TS 140S ..... Call for trade

New Kenwood TM-721A, mobile ..... Call
ICOM 28H/TTM 410.00



Icom 761 ..... 2300.00
Shure 444D 56.95
HEIL BM10 Boom Mike, wired 8 pin 69.00
HEIL HM5 Desk Mike 62.00
Cushcraft 124-WB (146 MHz) 39.00
Butternut HF6VX, 80-10 vertical 125.00
Hustler G7-144 ..... 129.00
Larsen 2-meter on glass 49.95
Anteco 2M, 5/8, Mag. Mount, Comp 25.00
Van Gordon G5RV 44.00
Valor AB5 mobile 79.00
Thousands of panel meters ..... 3.95 up CALL
Aerovox 1000 pf/500 V feedthrough caps 1.95
Transformer 120 V Pri., 1050 V/1A. (Sec. #18 Wire) 50.00
100 mfd/450V Axial Cap 2.20
120 mfd/450V Axial Cap 3.00
Arista SWR Bridge 3-30 MHz 19.95
831SP-PL259 Silverplate (Amphenol) 1.50
82-61 N Male (Amphenol) 3.50
82-202-1006 N Male (9913) 3.50
Double Female UHF 1.00
UG176 RG8X ..... each .40
Receiving tubes 50-90% off list price
Santec Boom Mike/Headset (fits ICOM) 20.00
Rohn SA 25G 67 (67 inside arm) ..... each 125.00

IC 781 ..... Call

USED EQUIPMENT
All equipment, used, clean, with 90 day warranty and 30 day trial. Six months full trade against new equipment. Sale price refunded if not satisfied.
Call for latest used gear
(800) 231-3057

GNU PROD
TE Systems 2m Amp 30-160 watts GaAs fet $229.00

POLICIES
Minimum order $10.00. Mastercard, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. All items full factory warranty plus Madison warranty.
Bird and Belden products in stock. Call today.

MADISON
Electronics Supply
3621 FANNIN
HOUSTON, TEXAS 77004

CIRCLE 25 ON READER SERVICE CARD

CUSTOM EMBROIDERED
QUALITY HAM HATS
$7.95 ea

Display your **name, call and hometown** on our **top quality** summer mesh cap with white seamless front and matching bill in **royal blue, red or brown** with matching thread.

WINTER CORDUROY also available in red or navy blue with white thread. $8.95 ea
Please send: first & last name (max. 14 ltrs) call (max. 6 ltrs), city & state (max. 14 ltrs)

Visor available with call sign **only** white with navy thread. $6.95 ea

BE SURE TO INCLUDE COLOR

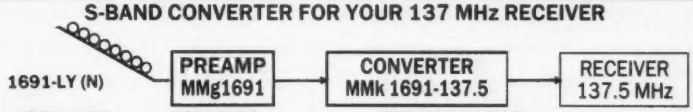
Send Check or Money Order, Plus $3.00 Shipping and Handling Per Order. Add 25¢ for each add'l cap ordered.

ALLOW 3 TO 5 WEEKS FOR DELIVERY.
MD RESIDENTS ADD 5% SALES TAX

Embroidery Warehouse
P.O. Box 1476 • Severna Park, MD 21146

GOES 1691 MHz RECEPTION

S-BAND CONVERTER FOR YOUR 137 MHz RECEIVER



1691-LY (N)	MMg 1691	MMk 1691-137.5
GAIN: 20dB	GAIN: 13dB	GAIN: 20dB TYPICAL
BOOM: 6'	N.F.: 1.2dB	N.F.: 4.8dB MAXIMUM
$86.50	12VDC @ 40 ma	12VDC @ 80 ma
	$250.00	$330.00

Send 75¢ (3 stamps) for detailed specs on all VHF & UHF products. Shipping FOB Concord, MA
PRICES SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

SI SPECTRUM INTERNATIONAL INC. (508) 263-2145
P.O. Box 1084S, Concord, MA 01742, USA

CIRCLE 163 ON READER SERVICE CARD

Affordable Packet

TINY-2 *is our new low-cost high-performance standard for packet controllers. Thousands already in use, worldwide. A perfect beginner's unit.*
Complete, wired and tested, only **$119.95**

BENEFITS *and features of both units:*
- ☐ *Optional personal message system (mini-BBS) Add $10.00*
- ☐ *Tiny enough for briefcase/portable, yet large enough for easy experimentation or repair.*
- ☐ *1-year limited warranty, excellent customer support.*
- ☐ *RS-232 and TTL compatible—all connectors supplied.*
- ☐ *Latest AX.25 software, TCP/IP (KISS) module included.*

MICROPOWER-2 *is our remarkably compact, 18-ounce unit using upgraded TAPR TNC-2 technology that requires less than 40 milliamps! For very portable operation, solar or battery, you need not pay more for a TNC that's about the size of your HT!* *Was $179.95, now at a low* **$159.95**

- ☐ *Fully compatible with ROSE & NET/ROM EPROMs.*
- ☐ *32K RAM, 32K ROM, 4.9 mHz CPU.*
- ☐ *Xtal controlled modem, compatible with use on 10m HF/VHF/UHF.*

TO ORDER, *toll-free with major charge card, call:* **1-800-223-3511**
Technical support line: 813-874-2980

Pac-Comm
3652 West Cypress St., Tampa FL 33607

Please send: ☐ *Tiny 2* ☐ *MicroPower-2* ☐ *TNC-220 info.* ☐ *FREE Packet Catalog.*

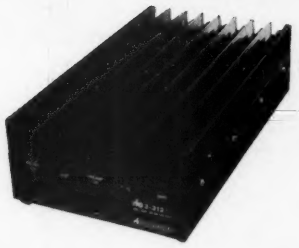
Name _____ *Call* _____
Address _____ *City* _____
State _____ *Zip* _____ *Card Number* _____ *Exp. Date* _____

Money Back Guarantee. *Add $3. shipping/handling per order, FL addresses add 6%. Major Credit Card: give number, expiration and signature. FAX: 813-872-8696*

CIRCLE 152 ON READER SERVICE CARD

73 Review by Pete Putman KT2B

RF Concepts Model 3-312 220 MHz Power Amplifier



A great way to boost your signal.

RF Concepts
2000 Humboldt Street
Reno, Nevada 89509
Price Class: $264

A common saying in ham radio goes something like, "You can never have enough power." Perhaps I can amend that somewhat to read, "It's always nice to have more power" . . . especially on 220 MHz, where there are a variety of operating modes, from weak-signal work to repeaters and packet.

RF Concepts has answered that need quite nicely with the RFC 3-312, a medium-power "brick" with a built-in preamplifier. Following in the footsteps of their very popular amplifiers for two meters, Everett Gracey WA6CBA and Ken Holladay K6HCP have brought forth a nice complement to the wide range of 220 MHz transceivers available today.

The RFC 3-312 is designed to accept drive power over a range from 200 mW up to 40 watts, which pretty well covers all the bases. Both hard keying and RF-sensed, VOX-type keying are available, and a preamp is included to help pull out the weak ones. The attractive, black aluminum housing has more than enough heatsink capacity.

The device line-up consists of a pair of Motorola SRF3883 devices with a hybrid combiner operating in Class AB mode. Therefore, the 3-312 is capable of linear operation with any mode of modulation, be it FM, AM, SSB, or just CW. The preamplifier is a Telefunken CF-300 GaAs device driving a U309 buffer amplifier, with the combination yielding 18 dB of gain at about 1.2 dB noise figure.

Front panel controls select power, SSB/FM mode, and preamp. Incidentally, I've found that a bit of confusion exists regarding the SSB/FM switch on most solid-state amplifiers. It does not change the mode of operation, only the keying drop-out delay! When in FM, the amplifier still operates in Class AB, **not** Class C, as some operators apparently think.

Rear panel connectors for RADIO and ANTENNA are conventional UHF types. A four-pin TRW/Jones connector is used for power, while a standard RCA connector enables the hard-keying circuit. The RFC 3-312 is factory wired for positive keying as opposed to negative keying, as the manual claims that "most transmitters have a positive voltage available at their back panel." The good news is that you can remove the cover and change one plug-in jumper when you want to go back to negative keying. This review amplifier was tested with an ICOM IC-375A (that does have negative keying), as well as with a plain old footswitch.

One additional connector is a 5-pin DIN-type that enables remote control of the amplifier's functions. It's similar to the Mirage remote control function. Although RFC does not now make a remote control head, they have a schematic of the jack wiring, and they supply a companion 5-pin DIN plug so you can roll your own. Finally, the dropout delay in SSB mode is adjustable via a hole in the side.

Measurements

See below for the test results. For the preamplifier test, I used an HP-608F signal generator and Boonton 92 RF millivoltmeter; for the amplifier test, an IC-375A as the signal source, two 6 dB pads, two Bird Model 43 at the input and output, and an Astron RS-35M power supply. Note that all measurements were made at 14.3 volts, as opposed to the specified 13.8 volts, so power output may be a bit higher than the average.

Performance Tests

RFC 3-312 220 MHz Power Amplifier

Amplifier

Input Power	Output Power
2 watts	22 watts
4 watts	50 watts
6 watts	75 watts
10 watts	95 watts
15 watts	105 watts
17 watts	110 watts
20 watts	120 watts
25 watts	125 watts

Test voltage: 14.3 VDC.
Maximum current @ 125 watts: 18.5 amps.

Preamplifier

Input Level	Output Level
−40 dBm	−24 dBm
−30 dBm	−19 dBm
−25 dBm	−9 dBm
−23 dBm	−7 dBm
−22 dBm	−6 dBm
−21 dBm	−5 dBm
−20 dBm	−4.5 dBm
−19 dBm	−3.5 dBm
−18 dBm	−3 dBm

Preamplifier has 16 dB of gain.
1 dB compression occurs at −3 dBm output.

The RFC 3-312 certainly has an abundance of power. It easily met the factory specification of 120 watts output for 30 watts drive, and, although I used a slightly higher voltage, I would expect 25 watts of drive to saturate the amplifier at full output.

The preamplifier has enough gain to engage in serious weak-signal work, but may "crunch up" in a high RF environment. The 1 dB compression point of −3 dBm is slightly less than average performance for a GaAsFET design. High-performance units will typically have a 1 dB compression point of better than +3 dBm, and I consider 0 dBm to be about average. 220 MHz operators close to a TV Channel 13 transmitter may experience some degree of IMD products with this design.

Field Performance

The RFC 3-312 got a fairly rigorous workout during the 1988 June VHF QSO Party, as it was at one time or another (1) an intermediate driver stage for an 8877 power amplifier, and (2) a final stage for the 220 FM station. It took us a bit of tweaking, but we were able to coax 1200 watts from the 8877 with the 3-312 driven by the previously mentioned IC-375A. Our 220 SSB/CW station was constantly on the air as we worked over 80 stations in 28 grids with excellent reports.

Conclusion

The RF Concepts 3-312 220 MHz amplifier is a well-designed piece of equipment that will surely get a lot of use from 220 operators. Workmanship is of the highest quality and the amplifier easily meets the published specifications.

THE MOST AFFORDABLE REPEATER

ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

KIT, ONLY $675

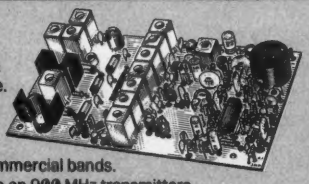
WIRED $975

VHF OR UHF

FEATURES:

- **SENSITIVITY SECOND TO NONE!** **GaAsFET front end** on vhf models gives 12dB SINAD of 0.12uV (vhf), 0.15uV (220). UHF model 0.25uV std, 0.1uV with optional helical resonator preamp.
- **SELECTIVITY THAT CAN'T BE BEAT!** Both 8-pole xtal filter & ceramic filter for >**100dB at only ±12kHz.** Helical resonator front end to combat desense & intermod.
- **CLEAN, STABLE TRANSMITTER,** up to 18W output standard; 50W with accessory power amplifier.
- **FCC TYPE ACCEPTED** for commercial high band and uhf.
- **Courtesy beep,** field-programmable CWID, flutter-proof squelch, automatic frequency control to compensate for off-frequency transmitters (all standard features).
- **Full range of options** available, such as autopatch, phone line or radio remote control, sub-audible tones, duplexers.

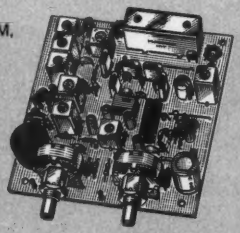
HIGH PERFORMANCE TRANSMITTERS & RECEIVERS FOR REPEATERS AUDIO & DIGITAL LINKS, TELEMETRY, ETC.



- **FM EXCITERS:** Kits $99, W/t $179. 2W continuous duty. TCXO & xtal oven options available.
- **TA51 for 10M, 6M, 2M, 150-174, 220 MHz.**
- **TA451 for uhf.**

FCC type accepted for commercial bands.

- Call for latest information on 900 MHz transmitters.
- **VHF & UHF AMPLIFIERS.** For FM, SSB, ATV. Output from 10 to 50 Watts. Several models, kits starting at $79.



- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220 MHz. **GaAs FET** front end, 0.12uV sensitivity! Both crystal & ceramic filters plus helical resonator front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere)! Flutter-proof squelch. AFC tracks drifting transmitters. Kit $149, w/t $229.
- **R451 UHF FM RCVR.** Similar to above. Tuned line front end, 0.25uV sens. (0.1uV with optional hel. res. preamp). Kit $149, w/t $229.
- **R901 FM RCVR FOR 900 MHZ.** Triple-conversion, GaAs FET front end, 0.2uV sens. Kit $169, w/t $259.
- **R76 ECONOMY VHF FM RCVR** for 10M, 6M, 2M, 220. Without hel res or afc. Kits only $129.
- **Weather satellite & AM Aircraft receivers also avail.**

FCC TYPE-ACCEPTED TRANSMITTERS & RECEIVERS AVAILABLE FOR HIGH-BAND AND UHF. CALL FOR DETAILS.

GaAs FET PREAMPS at a fraction of the cost of comparable units!

LNG -(*) GaAs FET PREAMP

ONLY $59! Wired/tested

FEATURES:

- **Very Low Noise:** 0.7dB VHF, 0.8dB UHF
- **High Gain:** 13-20dB, depending on frequency
- **Wide Dynamic Range:** to resist overload
- **Stable:** new-type dual-gate GaAs FET

** Specify tuning range desired: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

LNW -(*) MINIATURE GaAs FET PREAMP

ONLY $24/kit, $39 Wired/tested

GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

** Specify tuning range desired: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

ONLY $79/kit, $99 Wired/tested

GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W.

**Specify tuning range desired: 120-175, 200-240, or 400-500 MHz.*

HELICAL RESONATOR PREAMPS

Low-noise preamps with helical resonators **reduce intermod & cross-band** interference in critical applications.

MODEL HRA-(*), $49 vhf, $84 uhf.

** Specify tuning range desired: 143-150, 150-158, 158-162, 162-174, 213-233, 420-450, 450-465, or 465-475 MHz.*

NEW HIGH-SPEED DIGITAL RF LINKS

You've waited a long time for a simple, reliable, **low-cost 9600 baud PACKET NETWORKING system.** Now you've got it! Our new MO-96 MODEM and direct FSK Transmitters and Receivers for 220 or 440 MHz interface directly with most TNC's. Fast diode switched PA's output 15 or 50W. **Call for complete info on the right system for your application.**

ACCESSORIES

- **COR-3** Kit. Control ckts and audio mixers needed to make a repeater. Tail & time-out timers, local spkr ampl, courtesy beep $49
- **CWID** Kit. Field programmable, timers, the works $59
- **TD-2 DTMF DECODER/ CONTROLLER** Kit. Full 16 digits, switches 5 functions, toll call restrictor, programmable, much more. Great for selective calling too! $79
- **AP-3 AUTOPATCH** Kit. Use with above for repeater autopatch. Reverse patch and phone line remote control std. ... $79
- **AP-2 SIMPLEX AUTOPATCH TIMING BOARD** Kit. Use with above for simplex autopatch $39
- **MO-202 FSK DATA MODULATOR** Kit. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. $39
- **DE-202 FSK DATA DEMODULATOR** Kit for rcvr end of link $39

RECEIVING CONVERTERS

		Antenna Input Range	Receiver Output
		29-32	144-148
		50-82	28-30
		50-54	144-148
VHF		136-138	28-30
MODELS		144-146	28-30
		145-147	28-30
Kit with Case	$59	146-148	28-30
Kit less Case	$39	220-222	28-30
Wired w/case	$89	220-224	80-84
		222-224	28-30
UHF MODELS		432-434	28-30
Kit with Case	$69	435-437	28-30
Kit less Case	$49	432-436	144-148
Wired w/case	$99	432-436	80-84
		439.25	61.25
		902-928	422-448
		902-922	430-450

See catalog for full line of 2w transmitting converters for vhf & uhf. Kits only $79. Linear Amplifiers avail. up to 50 w.

- **Send $1 for 36 page catalog by return mail.** (Send $2.00 or 4 IRC's for overseas mailing)
- **Order by phone or mail • Min $3 S & H per order**
- **Use Visa, Mastercard, Check, or UPS COD.**

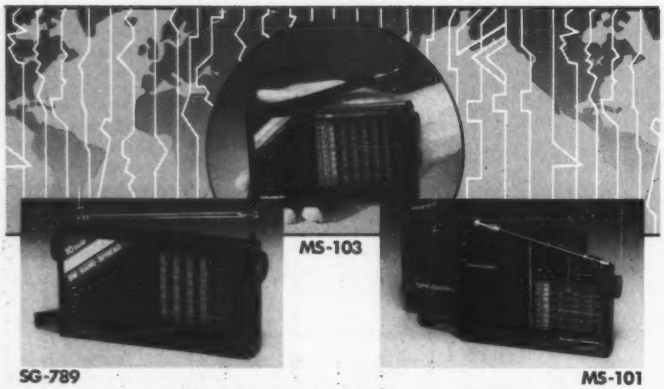
Our 25th Anniversary

hamtronics, inc.

65-J MOUL ROAD•HILTON NY 14468-9535

Phone:716-392-9430 Hamtronics® is a registered trademark

TRAVEL FIRST CLASS, PAY COACH.



SG-789 MS-101

Now, full feature 9, 10, and 12 Band World Receivers in a convenient shirt pocket size. Priced right for your budget including FREE Stereo Headphones. 1 year Limited Warranty on parts and labor. For a FREE full color catalog call 1-800-232-2929 (outside California), or 1-818-288-1661 (in California).

SANGEAN
A World of Listening™

9060 Telstar Ave., Suite, #202 El Monte, CA 91731 Telephone: (818) 288-1661 FAX (818) 288-8231

CIRCLE 14 ON READER SERVICE CARD

PRACTICE CODE ANYWHERE!

AT HOME
IN CAR
AT LUNCH

- Fits in Pocket
- Long Lasting Batteries Incl.
- Clear, Crisp Tone
- Free Wallet-Size Code Card Incl.

Actual Size

$24.95

Now you can turn free time into powerful code building time. For novice, CW, and advanced

ORDER TOLL FREE: 1-800-346-7283
Or Mail Check, Money Order to: STARTONE ELECTRONICS
P.O. Box 404, Aptos, CA 95001-0404
Ca., or info 1-408 662-2659
VISA MasterCard
Rush Shipped, 1st-Class **Each order add $3.50 ship./hand.**

BEST NOVICE KIT! $19.95

2 Code Tapes
112 pg Study Guide
FCC Test & Answers
Maps, Charts, Coupons & More.

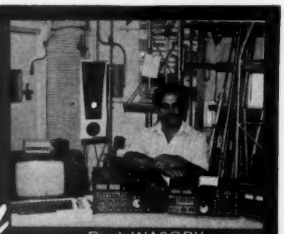
SAVE! BUY BOTH FOR ONLY $39.95

StarTone ELECTRONICS

CIRCLE 37 ON READER SERVICE CARD

Rob, WA3QLS

Delaware Amateur Supply



Paul, WA3QPX

AEA • ALINCO • AMERITRON • CUSHCRAFT • ICOM • KANTRONICS • KENWOOD • MFJ • MOSLEY • SANTEC • TELEX HY-GAIN • TENTEC • YAESU • AND MORE!

71 Meadow Road, New Castle, Del. 19720

Factory Authorized Dealer!

9-5 Daily, 9-8 Friday, 9-3 Saturday

Celebrating our 10th Anniversary!

Large Inventory, Daily UPS Service

800-441-7008

New Equipment Order & Pricing

302-328-7728

SERVICE, USED GEAR INFO

Katherine, KA3IYO

NO Sales Tax in Delaware! one mile off I-95

Prices are subject to change without notice or obligation. Products are not sold for evaluation.

Please send all reader inquiries directly.

A Lap-Top Repeater Controller

Full-featured repeater control from a PC-DOS lap-top computer.

Jim Edrington KF5WO

Several controllers have been built around home computers, such as the Commodore, Atari, and Radio Shack. These low cost computers perform basic repeater functions well. However, they lack many desirable features for a repeater controller or regular computer. Adding options to make these low cost computers more useful quickly raises their cost. The cost of adding a disk drive, for example, may be several times the price of the computer.

Until recently, full-featured microcomputers were large and power hungry, taking whole desk tops and requiring noisy fans for cooling. Now available at a reasonable price are a new breed of computers. They are the first to combine the power, features, and standardization (IBM compatibility) with the small size, battery powered capability, and other features desired for a repeater controller. These are the laptops, such as the IBM PC Convertible and the Toshiba 1000 series.

This article describes the hardware and software design of a repeater with the IBM PC Convertible as the controller. This design has been operating for over a year without attention, except for a few days following a lightning storm, that damaged the modem.

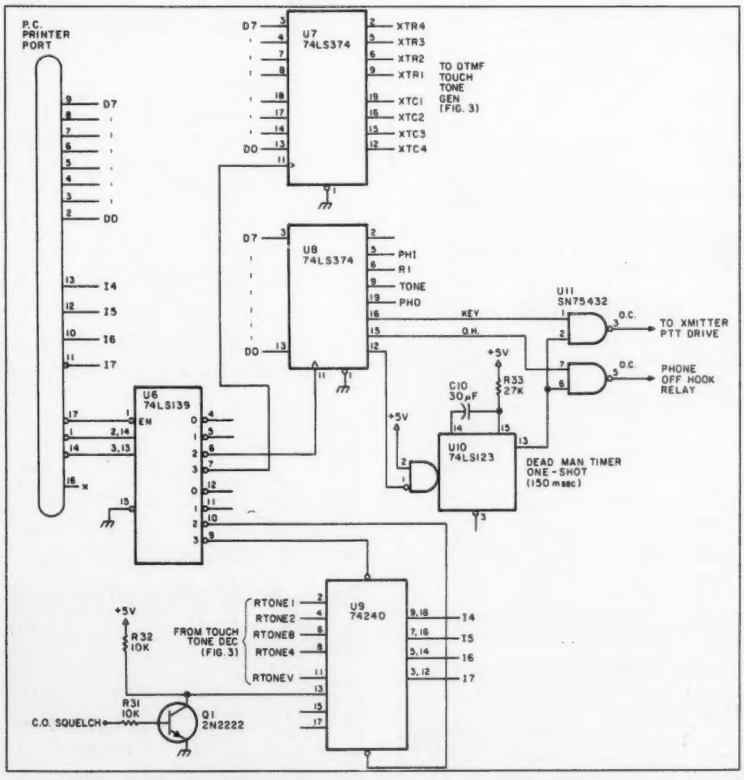


Figure 1. Schematic for the interface between computer and repeater.

Hardware Design

The design goal was to take as much advantage of the computer as possible, reducing custom hardware to an absolute minimum. It is always easier to duplicate software (DISKCOPY A: B:) than to duplicate hardware (buy, bend, solder, test, etc.). A computer, specifically modern laptop models, offer many of the hardware functions needed to build a top notch repeater controller.

- Battery backup built-in, for power transient immunity.
- Low power consumption, which is great for remote sites and long life.
- Built-in clock and calendar features.
- Internal modems for remote control and programming via the telephone.
- Small size, to fit in equipment racks.
- Built-in mass storage, for anything from program load to logging the history of repeater usage.
- Full programmability.
- A sufficient amount of regulated power for external circuits.

Many computers, including the Convertible, offer a speech synthesizer as an option. Speech adds highly desired features to modern repeaters. It allows non-code types to understand the ID, for example, and it reports phone patch operation.

Until the day when someone markets a "repeater controller adapter" for a personal computer (my apologies if there is one of which I'm not aware), some custom hardware will be required. For a repeater equipped with a phone patch, the following functions external to the computer are needed:

- Input to the computer from the radio receiver squelch.

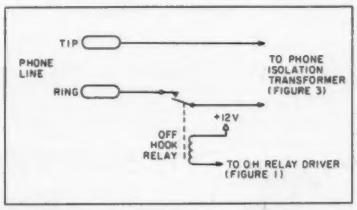


Figure 2. Telephone interface for the repeater controller.

Texpro

snap -on- choke

ELIMINATES RF INTERFERENCE IN:
TV sets, Radios, HI-FI, PA systems, Telephones, VCRs, Test equipment, Burglar and Fire alarms, Modems, Monitors, Computers, Radio and TV stations, etc.

EASY TO USE: fits over and snaps onto small, large and ribbon cables. No need to rewire connectors. Unique, split ferrite core design fits up to RG8U coax cables.

WORKS IN "COMMON MODE", filters current induced in the braid of shielded cables and ground wires!

Special ferrite material effective 0.5 - 200 MHz.

DOES NOT VOID EQUIPMENT WARRANTY

Available from your dealer or order direct from:

Package of 4 chokes with inst. instructions
$12.99
+ $2.00 shipping

computeradio
Box 282, Pine Brook, NJ 07058
Tel: (201) 227-0712

Send personal check with order, we ship same day First Class. 30-day money back warranty. Quantity discounts.

CIRCLE 345 ON READER SERVICE CARD

QuickKit™ G5RV, Loop, & Dipole Kits

Fast & Easy to Build
- Everything included
- Failsafe visual instructions
- No measuring / cutting
- Finish antenna in minutes

Quality Components
- Pressoldered Amphenol PL259
- Kinkproof Superflex wire
- Fully insulated, wx sealed, no-corrode, low noise design

Fastest Antennas in the West
AntennasWest™
(801) 373-8425

- Full Size G5RV dipole coverage 80-10 — $34.95
- Half Size G5RV dipole coverage 40-10 — $24.95
- Quarter Size G5RV dipole coverage 20-10 — $19.95
- Marconi Adapter kit — $ 4.95
- Antenna Launcher kit — $14.95
- 200' Dacron 250# line — $11.95
- Loops, dipoles, feedlines, etc. Add $5 Shipping & Handling

Catalog $1 by 1st class mail
Box 50062-S, Provo, UT 84605

CIRCLE 302 ON READER SERVICE CARD

THIS MONTH'S GOODIE FROM THE CANDY STORE:
KENWOOD TS-680S

RDC

UNDER **$939.00** (November ONLY)

SIMILAR SAVINGS ON KENWOOD, ICOM, YAESU, HYGAIN, ETC. ALL L.T.O. M.F.J. 1278 UNDER $225.00
OVER 6788 HAM RELATED ITEMS IN STOCK. ALL PRICES CASH FOB PRESTON
More specials in classifieds.
LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE

ROSS DISTRIBUTING COMPANY (P.O. Box 234A)
78 South State Street, Preston, Idaho 83263
Telephone (208) 852-0830 We Close at 2:00 on MON. & SAT.

CIRCLE 254 ON READER SERVICE CARD

Entry Level Price.
Extra Class Performance.

New Optional Scanning Microphone

Now Novices and Technicians can enjoy their new 10 Meter phone privileges and DXing with our new Ranger AR 3500 Mobile Transceiver!

- Two Models to Fit Your Budget & Power Needs: 30 Watt & 100 Watt
- Microprocessor Controlled Circuitry • Exceptional RX Specifications
- Very Compact • Manufactured in Japan & Quality Checked in U.S.
- Low Breakthrough Price • *New* Optional Scanning Microphone

- East Coast Warranty Center
- Exclusive NI-Cad Battery Backup
- Dealer Inquiries Welcome

Call or send for free brohure

RF MicroTech
(508) 667-8900

4 Carmel Drive
N. Billerica, MA 01862

CIRCLE 78 ON READER SERVICE CARD

SUPER PERFORMANCE BATTERIES

SUPER KENWOOD

BY POPULAR REQUEST

SUPER KENWOOD PB-25S/PB-26S. 8.4 volts, 900ma, double the capacity of the PB-25/PB-26 for the 2500/2600/3500/3600. Charge with either the standard wall charger or drop in charger. 3 inches high. $65.00*

Exact replacement FNB-2 Nicad pack for Yaesu FT-404R/207R/208R/708R $27.00*

SUPER ICOM

SUPER ICOM BP-7S. 13.2 volts, 900ma, double the capacity of the Icom BP-7, 5w output.

SUPER ICOM BP-8S. 9.6 volts, 1200ma, 50% more capacity than the Icom BP-8.

Both are rapid base charge only, or slide in wall charger. 4 inches high. BP-7S or BP-8S $69.00*

Inserts for:

Kenwood PB-25, 25H, 26	$29.00*
Icom BP-3	$22.00*
Icom BP-5 (500ma)	$30.00*
Icom BP-7 (500ma)	$35.00*
Icom BP-8	$34.00*

*Add $4.00 shipping & handling, CT residents add 7½% tax.

Complete line of NICAD replacement packs for Icom, Kenwood, Yaesu, Tempo, Santec, Azden, Cordless Telephones, Alkaline, Nicad and Gell-Cells. All NICAD packs include a 1 year guarantee. Commercial Radio Packs also available.
For all your battery needs, write or call today for a complete catalog. Dealer inquiries invited.

PERIPHEX inc.
149 Palmer Road • Southbury, CT 06488
(800) 634-8132 In CT (203) 264-3985

VISA DISCOVER MasterCard

CIRCLE 68 ON READER SERVICE CARD

QEP's NOT TOO LATE SALE

Your not too late, copper prices WILL drive up the price of coax even more. Better buy it NOW.

- **BELDEN 9913 low-loss**
  500 ft Roll $200.00 or 42¢/ft.
- ~~**BELDEN 8214 (foam)**~~ **N/A**
  500 ft Roll $165.00 or 36¢/ft.
- **BELDEN 8267 RG-213**
  500 ft Roll $200.00 or 46¢/ft.

AMPHENOL SPECIALS

PL-259	silver (mica filled)	$1.25
UG-21D	'N' male cable end	2.75
UG-21D	'N' (fitted for 9913)	3.50
UG-23D	'N' female cable end	3.95
UG-29A	'N' Barrel (jack-jack)	4.50
UG-57B	'N' Barrel (plug-plug)	5.20
UG-58A	'N' Chassis receptacle	3.50
UG-83U	'N' Plug to UHF Jack	8.00
UG-146	'N' Jack to UHF Plug	6.95

Copper-clad 14 ga. (7x22)
7¢ a foot (any length)
Identical to Belden 8000

VISA & MASTER CARD ACCEPTED
SHIPPING IS ADDITIONAL
Call TOLL FREE
1-800-USA-9913
in NJ 201-887-6424

110-4 Route 10
East Hanover
N.J. 07936

QEP's

**** SAME DAY SHIPPING ****
TNX JIM N2GKW & BILL KA2QEP

CIRCLE 30 ON READER SERVICE CARD

Let the Sun Power your Station!

The $289.95 Bullet-Tested QRV Solar Power Supply keeps your repeater on the air 'round the clock or powers your 100w HF station 60 hrs a month. Control circuit speeds charge, protects gel cells & sealed batteries. Fully assembled, QRV portable. Easily expanded.
Add $10 S&H Air Mail Info $1
AntennasWest
(801)373-8425 Box 50062-S Provo UT 84605

CIRCLE 303 ON READER SERVICE CARD

PERSONALIZED MUGS

Your Call sign & ARRL logo on a 10 oz. coffee or 15 oz. beer mug

A GREAT GIFT IDEA OR CLUB AWARD

10 oz. Mug $5.95 — 2 for $10.95
15 oz. Mug $7.95 — 2 for $14.95
(pairs can have different designs) s/h $1.50 Per Order
Allow 6 wks delivery. NC residents add 5% tax

Send Check Today To: CALL SIGN CUPS
P.O. BOX 17062, Raleigh, NC 27619

CIRCLE 344 ON READER SERVICE CARD

HI-PERFORMANCE DIPOLES

Antennas that work! Custom assembled to your center freq. ea. band - advise ht. of center and each end - hang as inverted "V" - horizontal, vert dipole, sloping dipole - commercial quality - stainless hardware - legal power - no-trap, high-efficiency design. Personal check, MO or C.O.D. ($3)

MPD-5*	80-40-20-15-10M max-performance dipole 87' long	$105ppd
MPD-2	80-40M max-performance dipole, 80' long 982	95' $80 ppd
HPD-3*	160-80-40M hi-performance dipole 113' long	$79 ppd
SSD-6*	160-80-40-20-15-10M space saver dipole 71' long	$125 ppd
SSD-5*	80-40-20-15-10M space-saver dipole-specify L. 42'-$105 . 52'-$100 ppd
SSD-4*	80-40-20-15M space-saver dipole-specify L. 48'-$95 . . . 80'-$ 90 ppd

*9-bands with wide-matching-range tuner.

SASE for catalogue of 30 dipoles, slopers, and space-saving, unique antennas

WYMM ANTENNAS
312-394-2414 BOX 393 MT. PROSPECT, IL 60056

CIRCLE 38 ON READER SERVICE CARD

Comm Pute Inc (801) 467-8873
1057 E. 2100 So. • Salt Lake City, Utah 84106
We want to be Your Radio Store
Full Line of Amateur Radios, Computers, Interfacing & Accessories Tim W7IQY or Preben K7KMZ
CALL NOW FOR OUR CHRISTMAS SPECIALS
KENWOOD ICOM YAESU

CIRCLE 343 ON READER SERVICE CARD

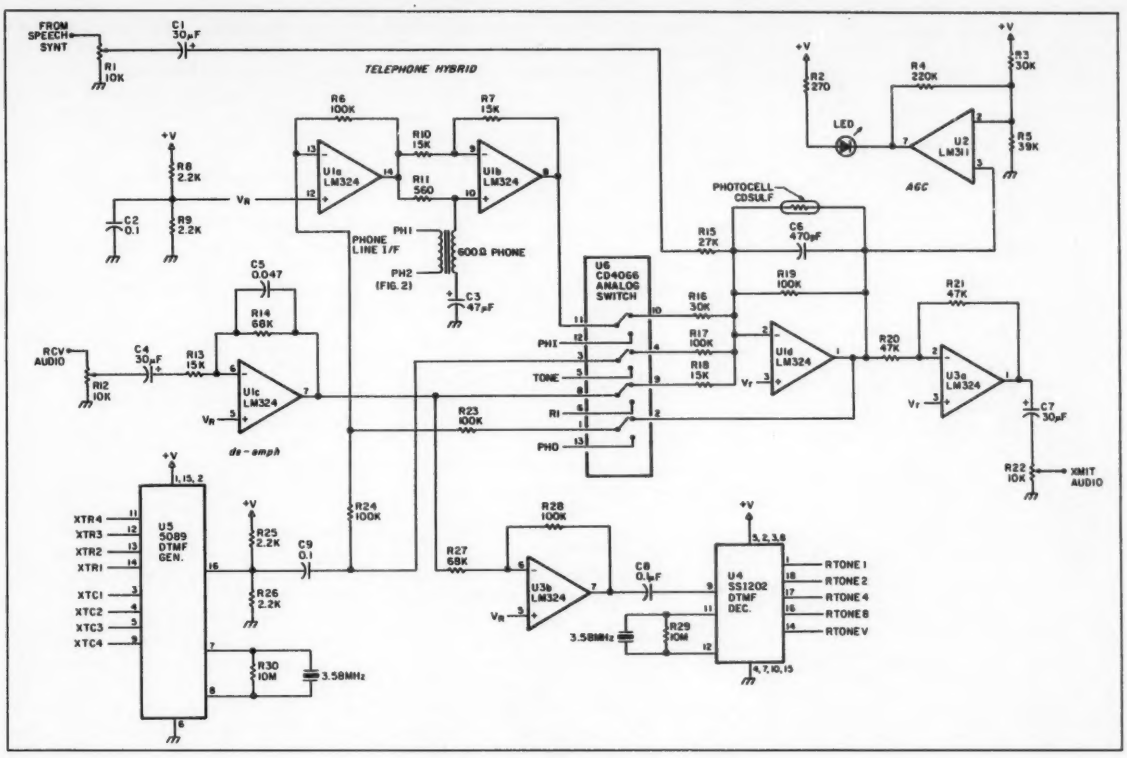


Figure 3. The audio circuits for the repeater controller.

- Output from the computer to key the transmitter.
- A dead-man timer function, to disable the transmitter if the computer or software should fail.
- A tone generator, for repeater ID.
- Audio circuits for de-emphasis/pre-emphasis, level control, and audio routing.
- Some means of remote control, so that a control operator can disable the repeater in case of trouble.
- The telephone interface, with its associated off-hook circuitry, DTMF generator, DTMF decoder with protection, and isolation.

The Computer Interface

Somehow the computer and the repeater hardware must talk to each other. In computer talk, this is known as the interface. An interface can take many forms, and can vary widely from computer to computer.

To simplify connection to the computer, and to make the connection standard, we routed all computer input and output (except for speech and power) through the printer port. Virtually all personal computers use a Centronics-type parallel printer port. Although this port is normally for output only (eight lines with a strobe), nine of its status lines will work for input as well as output. These lines are normally used for such functions as monitoring the printer's paper supply and on-line status.

Since the above functions require more than 17 lines, multiplexing (using a line for more than one purpose) was necessary. Two of the output control lines were decoded into four select signals using a 74LS139 type decoder chip. These select signals control 74LS374 octal latches, enabling the computer to provide up to 32 individual outputs (four times the normal eight). The computer can read up to 16 input lines by using the four select lines to multiplex data onto four of the input status lines. Only 16 output lines and eight inputs lines are implemented here. For maximum reliability, a separate control line is dedicated to the dead-man timer. This circuitry is shown in Figure 1, the interface schematic diagram. The logic used to implement these circuits is the 74LS series. You could use equivalent functions in CMOS for lower power consumption.

The Telephone Interface

A typical telephone interface is shown in Figure 2 and part of Figure 3. You need FCC approval before connecting anything directly to the public phone network. All circuitry on the telephone side of the transformer should be well isolated from other circuitry and the chassis. Keep in mind that the DC voltage on an open phone line is about 48 volts, and that when the phone rings, 150 volts peak-to-peak appears on the line. Keep fingers off!

In Figure 3, when the two op amps (U1A and U1B) are connected to the telephone transformer, they perform the "hybrid" function which prevents the outgoing audio from appearing as incoming audio. Equivalent circuitry in a telephone receiver allows you to hear Aunt Emma in Osh Kosh, but not your own voice too loudly. U1A drives the telephone line through the transformer. U1B is connected so that the voltage at the output of U1A appears at the inverting and non-inverting inputs (of U1B) equally, thus canceling each other. The voltage at the phone transformer, appearing only at the non-inverting input of U1B, is amplified.

In Figure 1, a relay closes a path for direct current through the primary side of the phone transformer. This tells the phone company that you are "off hook." This relay is also controlled by the computer via the printer port.

Audio Circuitry

The controller must handle four audio sources. They are receiver audio, speech synthesizer audio, dialing tones, and telephone audio. Audio must be routed, at the proper time and level, to the transmitter and/or the telephone.

The audio circuitry of the controller is shown in Figure 3. This circuitry is built around a summing op amp (U1D) with four possible inputs, some switched. The switch is a CD4066 IC analog device (U6) which the computer controls. This way, the proper audio signal is sent to the transmitter and/or the telephone, depending on the operating mode. Note that all outgoing audio is passed through an AGC (automatic gain control) circuit to prevent overdrive. The gain control element is a Cadmium-Sulfide photo detector used as a variable resistor in the feedback path of op

amp U1D. Whenever the output of U4 reaches voltages that exceed the voltage formed by the R3, R4, and R5 network, the LM311 comparator (U2) switches on the LED. This illuminates the Cadmium-Sulfide photocell and causes its resistance to drop, reducing the gain of U1D. Because the reaction time of the photocell is very slow compared to audio frequencies, the result is a gradual change in gain. U1D, as well as all the other op amps, is ¼th of an LM324 quad op amp. We picked this op amp because it operates well on low voltage, permitting all circuits to operate on +5 volts.

Receive audio is passed also to an SSI-202 IC (U4) which detects DTMF tone pairs. The logic signals indicating these tone pairs are passed to the computer interface for autopatch and control operator functions.

The computer interface controls a 5089 type DTMF generator (U5) that produces dialing tones for phone calls and Morse code identification of the repeater.

Table 1 shows the modes of operation, and the state of all switches and relays in each mode.

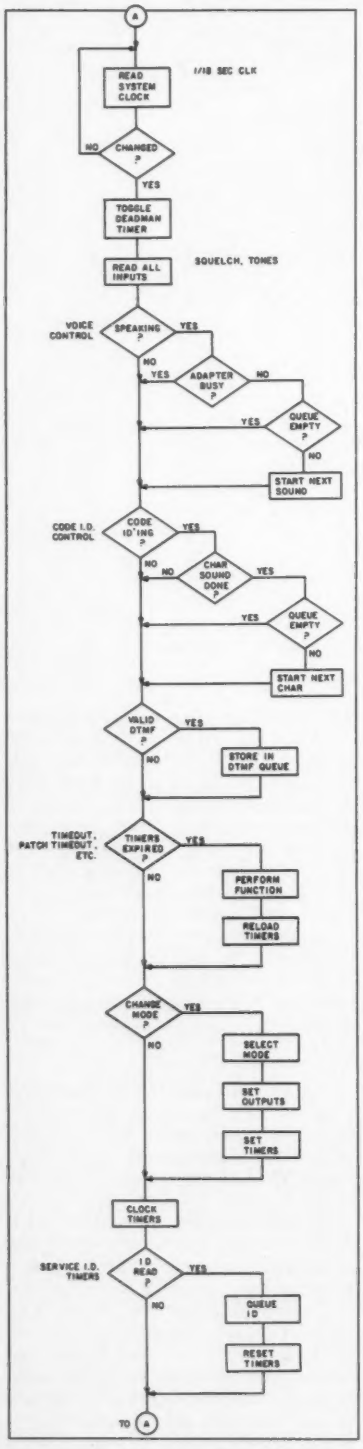


Figure 4. Flowchart of the repeater controller program.

The Speech Synthesizer

We chose the IBM PC Convertible partly because of the optional Speech Adapter. This does not preclude the use of other computers, as speech devices are available for standard PCs, and could be adapted to most laptops.

The Convertible speech adapter is almost identical in function to the one for the PC Jr (also from IBM). It contains two speech systems, one for canned speech (using the ever present Texas Instruments speech chip) and the other for recording and playing back speech. For this application, only the canned speech was used, since the computer cannot do anything else while the record/playback mode is in operation. This means a compromise in the real-time control of the repeater.

The Computer

The Convertible has 256K of RAM, two floppy disk drives (although only one is needed), an LCD, and an internal 1200 bps modem. Snapped on the back (which is how options are attached) are two adapters: a speech adapter and a serial/parallel (printer) adapter. An external power unit supplies 12–15 volts to the computer, which has an internal battery. This battery normally powers the computer for six or more hours, which is adequate for most power outages. In reality, it will probably lose its capacity after a few months of full charge, since NiCds need to be discharged regularly.

A good solution to this problem is to float a small lead-acid battery in parallel with the external power source (with diodes to prevent reverse current flow). Lead-acid batteries will operate for years if not overcharged. Motorcycle or lawn tractor batteries are ideal.

If the computer loses power, it will do no harm. When power is restored, the software and all programmed phone numbers, and other data, are reloaded from the floppy disk. Time functions, such as the computer's internal clock/calendar, have to be reset after a power down.

Writing the Software

To get this repeater going, I spent much time writing and debugging software. Software is best understood when viewed from two angles. The first is a distant observation of the high level functions, and the second is a close observation of the details of each function. This is like studying the design of a radio transceiver—first you look at the block diagram to see the overall signal flow, then you look at the schematic to determine the function of each component.

One of the advantages of the full-featured computer, such as an IBM PC or compatible, is the wealth of powerful development tools. Text editors, such as PC-Write, are available at minimal or no cost, and are essential to ease code writing and documentation. Professional level assemblers and compilers are also now available from Borland and MicroSoft, among others, for $50 and up.

The program for this controller was written in Lattice "C." The "C" language has recently become the standard for program development almost everywhere. Certain portions of the program, such as those interfacing with the repeater hardware, were written in 8088/86 assembly language, which is easy to use with most "C" compilers. Borland's Turbo Pascal would be a good alternative, with its built-in capacity to produce inline assembly language.

Programming The Program

When we talk about programming, we must distinguish between the program running in the computer's microprocessor, and the program the user accesses to set the ID (call sign), speed-dial phone numbers, repeater timeout limits, and so forth. I call the latter "user programming."

Continued on page 33

Mode	RCVR	DTMF	PHONE IN	PHONE OUT	XMTR KEY	OFF HOOK	SPEECH
Idle							
Repeat	X				X		
Calling Announce	X				X		X
Patch Dialing					X	X	
Patch Transmitting			X		X	X	
Patch Receiving	X			X	X	X	
Voice IDing	X				X		X
Code IDing	X	X			X		

Table 1. Controller Operating Mode.

National Tower Company

P.O.Box 15417 Shawnee Mission, KS. 66215

Hours 8:30-5:00 M-F

Price Subject to Change Without Notice

913-888-8864

ROHN — FREE BASE STUBS WITH EACH BX SERIES TOWER

25G	10' section	$56.50
25AG2 & 3	model 2 or 3 top section	$66.00
25AG4	model 4 top section	$73.50
45G	10' section	$133.00
45AG3 & 4	model 3 or 4 top section	$136.00
55G	10' section	$166.50
M200	10' mast, 2"o.d.	$13.50
BX-40	40'self supporting [6 sq.ft.]	$196.00
BX-48	48'self supporting [6 sq.ft.]	$250.00
BX-56	56'self supporting [6 sq.ft.]	$334.50
BX-64	64'self supporting [6 sq.ft.]	$431.50
HBX-40	40'self supporting [10 sq.ft.]	$226.50
HBX-48	48'self supporting [10 sq.ft.]	$308.00
HBX-56	56'self supporting [10 sq.ft.]	$392.50
HDBX-40	40'self supporting [18 sq.ft.]	$284.50
HDBX-48	48'self supporting [18 sq.ft.]	$384.50
	★ GUY WIRE SPECIAL ★	
3/16EHS	500' galvanized 7 strand	$40.00
1/4EHS	500' galvanized 7 strand	$50.00

HYGAIN/TELEX ANTENNAS

HF ANTENNAS — Tribands

TH3JRS	3 element 'Junior Thunderbird'	
TH5MK2S	5 element 'Thunderbird'	
TH2MK3S	2 element 'Thunderbird'	
TH7DXS	7 element 'Thunderbird'	
EXP 14	Explorer 14 triband beam	
QK710	30/40 M conv. Exp 14	

Monoband

103BAS	'Long John' 3 element 10 mtr	
105BAS	'Long John' 5 element 10 mtr	
155BAS	'long John' 5 element 15 mtr	
204BAS	4 element, 20 meter	
205BAS	'Long John' 5 element 20 mtr	
7-1S	'Discoverer' rotary dipole 30/40mtr.	
7-2S	'Discoverer' 2 elem. 40 meter beam.	
7-3S	converts 7-2S to 3 elem. beam	

Multiband Verticals

18HTS	'Hy-Tower' 10 thru 80 meters	
14RMQ	roof mt kit for 12 AVQ,14AVQ and 18ATV/WB	
18VS	base loaded, 10 thru 80 meters	
12AVQS	trap vertical 10 thru 20 meters	
14AVQ/WBS	trap vertical 10 thru 40 meters	
18AVT/WBS	trap vertical 10 thru 80 meters	

Multiband Doublets

18TD	portable tape dipole 10-80 meters	
2BDQS	trap doublet 40 and 80 meters	
5BDQS	trap doublet 10 thru 80 meters	

VHF ANTENNAS — Beams & Verticals

23BS	2 meter 3 element beam	
25BS	2 meter 5 element beam	
28BS	2 meter 8 element beam	
214BS	2 meter 14 element beam	
64BS	4 element 6 meter beam	
V-2S	colinear gain vertical 138-174 MHz.	
V-3S	colinear gain vertical 220 MHz	
V-4S	colinear gain vertical 430-470 MHz.	
GPG2A	base, 2 mtr. ground plane 3 dB	

VHF & UHF Mobiles

HR144GRI	figerglass 2 mtr. 6dB gain 3/8-24 mt	
HB144GRI	HyBander 2mtr 6dB gain 3/8-24 mt.	
HB144MAG	HyBander 2 meter	
BN86	ferrite balum for 10-80 meters	

OSCAR LINK ANTENNA

215S	70cm, 435 MHz	
218S	Complete Oscar link system	

CUSHCRAFT ANTENNAS

AOP-1	complete Oscar Link system	$169.00
AP8	8band ¼wave vertical	$152.00
A3	3 element triband beam	$246.00
A743	7 & 10 MHz add on kit for A3	$81.00
A744	7 & 10 MHz add on kit for A4	$81.00
4218XL	18 element 2 mtr, 28.8' boomer	$125.00
R4	10,12,15,20 meter vertical	$204.50
A4S	4 element triband beam	$344.00
AV4	40-10 mtr. vertical	$94.50
AV5	80-10 mtr. vertical	$111.00
ARX2B	2 mtr. 'Ringo Ranger'	$39.25
ARX450B	450 MHz. 'Ringo Ranger'	$39.25
A144-11	144 MHz. 11 ele. VHF	$50.50
A147-11	11 element 146-148 MHz. beam	$50.50
A147-22	22 element 'Power Packer'	$141.75
A144-10T	10 element 2 mtr. 'Oscar'	$54.00
A144-20T	20 element 2 mtr. 'Oscar'	$77.50
215WB	15 element 2 mtr. 'Boomer'	$81.00
220B	17 element FM 'Boomer'	$101.25
230WB	144-148MHz, 30 element	$216.00
32-19	19 element 2 mtr. 'Boomer'	$101.25
424B	24 element 'Boomer'	$81.00
10-4CD	4 element 10 mtr. 'Skywalker'	$124.75
15-4CD	4 element 15 mtr. 'Skywalker'	$145.00
20-4CD	4 element 14 MHz 'Skywalker'	$310.50

HUSTLER ANTENNAS

4BTV	40-10 mtr. vertical	$79.00
5BTV	80-10 mtr. vertical	$105.00
6BTV	6 band trap vertical	$124.00

ROTORS

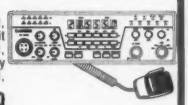
Alliance	HD73 [10.7 sq.ft.]	$104.00
Alliance	U110	$47.00
TELEX	AR40 TV, 3 sq ft	CALL
TELEX	CD45-II [8.5 sq.ft.]	CALL
TELEX	HAM IV [15 sq. ft.]	CALL
TELEX	T2X [20 sq. ft.]	CALL

CABLE

[2-18 & 6-22]	4080 - per foot	$0.18
[2-16 & 6-20]	4090 - per foot	$0.35
1108	RG8U Mini 8 low loss foam per foot	$0.17
1198	RG8U Columbia superflex 100'	$31.00
1180	RG8U Low loss 100% bonded foil shield 88% tin copper braided sheild -per foot	$0.35

★ CALL FOR PRICES ★

RANGER



10 meter TRANSCEIVER, 25 watt, can be programmed to split transceive, SSB, CW, AM, FM, programmable scanning, fully automatic, noise blanker, 2 3/8H, 7¾W, 11D.

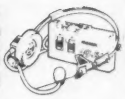
AR3500 ..... **$349.00**

uniden

25 WATT 10 Meter Transceiver, all mode operation, backlit multi function LCD meter, frequency lock, auto squelch, NB, RF gain, PA, external speaker jack. 7¼Wx9¼Dx2 3/8H.

HR2510 ..... **$239.90**

MAXON....$26.95



Model 49SA - 49 MHz, FM 2-WAY RADIO hands free operation, voice activated transmit up to ½ mile. Batteries optional

model 49B **$34.95**

same features as 49SA except uses "AA" nicad batteries and comes with battery charger

ASTATIC

D104 SILVER EAGLE **$69.90**

Chrome plated base station amateur microphone. Factory wired to be easily converted to electronic or relay operation. Adjustable gain for optimum modulation.

ETS D104 SE **$89.90**

NEW, same as above with end of transmision 'Roger Beep'.

RADAR DETECTORS

UNIDEN

RD500 ..... **$69.90**
Dual conversion superhet, city/hwy, LED's, audible alarm, compact.

RD9 ..... **$114.90**
2 power cords, travel case, dual conversion superhet, city/hwy, audible & LED alerts, mini size.

RD7 ..... **$79.90**
Dual conversion superhet, mini size, LED's, audible alert.

RD9XL **$149.90**
Superhet w/two power cords carry case, City/Hwy, mini size.

BEL

XKR100 ..... **$43.90**
LED alert, tone alert, X & K band, dash/visor.

876 ..... VECTOR $94.90
GAas diodes, sequential LED, City/Hwy, audio alert.

847 ..... **$134.90**
EXPRESS REMOTE, X & K band, Superhet, 2-way filter, LED & audible alerts.

MAXON

RD2A **$46.90**
Superhet, X & K band, audible & visual alert, city/highway setting.

RD3 ..... **$59.90**
Long range dual conversion, X & K band, LED's, audible alert w/volume control, antifalsing, city/hwy, dash/visor.

RD21 ..... **$54.90**
Mini size, audible & visual alert, omni-polarity guard, dash/visor.

RD25 ..... **$79.90**
Deluxe mini, same as above with sequential LED's.

RDXL **$129.90**
CORDLESS, X & K bands, anti falsing, sequential LED's, audible alert, city/hwy, dark/mute switch, with carry case.

TENNA PHASE III POWER SUPPLIES

PS3 ..... **$15.90**
Output 13.8V DC - 3 amp constant 5 amp surge, electronic overload protection w/instant auto reset, fuse protected.

PS4 ..... **$19.90**
Fully regulated, 13.8 VDC - 4 amps constant with surge protection, overload protection w/instant auto reset.

PS7 ..... **$24.90**
Fully regulated, 7 amp constant,10 amp surge capacity.

PS12 ..... **$34.90**
Fully regulated, 10 amp constant 13 amp surge, electronic overload protection w/instant auto reset.

PS20 ..... **$64.90**
Fully regulated, 20 amp surge capacity, 13.8 VDC, 17 amp constant, with meter.

PS25 ..... **$79.90**
Regulated 4.5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage.

PS35 ..... **$99.90**
Same as above except, 35 amp constant, 37 amp surge, adjustable from 10 to 15 volts.

uniden — Bearcat

BC55XLT

$114.90

10 Channel 10 band, programmable, keyboard lock, 2 digit LCD display, review, channel lockout, battery low indicator, memory backup, built-in delay, direct channel access, track tuning, accepts nicad batteries.

BC800XLT . $239.90

40 Ch 12 band, **800 MHz,** aircraft & weather, priority, track tuning, scan delay, auto search, direct channel access, auto squelch, channel lockout, AC/DC.

BC145XL . . . $92.90

16 Ch 10 band, programmable, 2 digit LED, priority, review, direct Ch access, track tuning, built-in delay, memory backup, Channel lockout, direct channel access, weather, AC/DC.

BC580XLT $189.90

100 Ch 11 mobile, service search, weather, priority, channel lockout, scan delay, auto search, illuminated, programmable, track tuning, direct channel access.

BP55C Battery pack & charger for BC55XL . **$29.90**

BC100XLT 100 Ch 11 band hand held **$199.90**
aircraft, ch lockout, auto search, programmable, with battery pack, AC charger, carry case & earphone.

BC200XLT 200 Ch 12 band, hand held **$269.90**
WITH 800MHz band, priority, ch lockout, auto search, track tuning, direct ch access, with battery pack, AC adaptor, carry case.

BC175XL 16 ch, 11 band aircraft **$149.90**
weather, ch lockout, auto search & squelch, delay, track tuning, memroy backup, high/low scan speed, direct Ch access, AC/DC.

BC210XLT 40 Ch, 11 band, aircraft & weather **$179.90**
Ch lockout, priority, scan delay, auto search, programmable, track tuning, direct Ch access, AC/Dc with mobile mounting bracket.

BC560XLT 16 Ch 10 band mobile **$99.90**
LED display, review, priority, memory backup, direct Ch access, weather search, built-in delay, track tuning, external speaker jack.

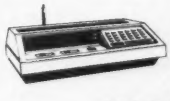
BC760XLT 100 Ch 12 band mobile **$279.90**
WITH 800 MHz, weather & aircraft, base/mobile, priority, service scan, ch lockout, scan delay, auto search, programmable, track tuning, direct Ch access, memory lock, memory backup, ext speaker jack.

BETTY BEARCAT Frequency Directory

BCFB-W ..... Western UN **$9.90**

BCFB-E ..... Eastern US **$9.90**

Regency®



INF5 . . . . $89.90

AC Powered TURBO SCAN® , pre-programmed by state to receive any type of police transmission plus fire and weather, scans at 50 channels per second, digital display, instant weather.

Z45 . . . . . $99.90

45 Channel 7 band w/aircraft, programmable, 45 preprogrammed channels, search or scan, alarm clock, priority, permanent memory backup, ch lockout, scan delay, AC/DC with both cords.

INF1 . . . . . $144.90

Preprogrammed mobile, receives all 50 states police, plus instant weather, scans 40 channels per second. DC.

TS2 . . . . . $269.90

75 Ch 12 band w/800MHz, mobile/base, with Turbo Scan® , bank scanning, instant weather, memory backup, ch lockout, scan delay, AC/DC with both cords.

SUPER CONVERTER

Installs on any scanner and is designed to receive frequencies between 810 MHz & 912 MHz and convert them down to 410 MHz thru 512 MHz, easy to install.

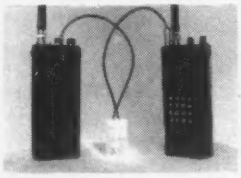
CIRCLE 323 ON READER SERVICE CARD

PORTA-LINK™ FOR ALL ICOM* HANDHELDS

The PORTA-LINK can easily be plugged into an ICOM* Handheld, using only the speaker jack and microphone input. This simple and straightforward design affords use without batteries or any external power connections. All of this gives your new PORTA-LINK the sound and reliability of the best repeater or remote base.

- High-quality glass circuit board
- Weatherproof design
- Small package
- Low cost
- No batteries needed (EVER)
- Can be used on any band to any band as an emergency repeater or remote base
- Excellent audio quality
- Two PORTA-LINKS can be used for full crossbanding
- Buy one for everyone in your club, for those big emergencies
- Provide a service to your club or emergency group by tying two bands together using a PORTA-LINK Dual. Use a PORTA-LINK Single as low power hamfest or emergency repeater.

PORTA-LINK™ Single

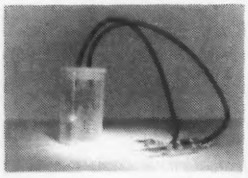


Use as one-way crosslink or repeater

$24.00 Kit $29.00 Assembled

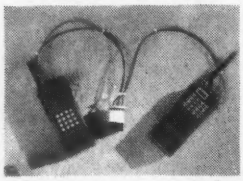
Handie Talkies not included.

PORTA-LINK™



IL deliveries 7% sales tax.

PORTA-LINK™ Dual



Use as two-way crosslink or one side as repeater

$65 Assembled

Handie Talkies not included.

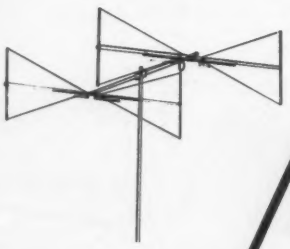
M. BOHNHOFF PRODUCTIONS
P.O. Box 1243
Wheeling, IL 60090
312/298-LINK • 312/298-5465

*ICOM and IC-2A, IC-2AT, IC-02AT, IC-3AT, IC-4A, IC-04A, are all trademarks of ICOM USA, Inc. or ICOM Inc. PORTA-LINK is a trademark of M. Bohnhoff Productions.
©1986 M. Bohnhoff Productions

CIRCLE 281 ON READER SERVICE CARD

HF ANTENNAS FROM BUTTERNUT

The HF5B "Butterfly"™
A Compact 2 Element Beam for 20-15-12-10 Meters
Operate As A Di-Pole on 17 Meters



- Unique design reduces size but not performance.
- No lossy traps; full element radiates on all bands.
- Turns with TV rotor
- 19 lbs.

Butternut Verticals

Butternut's HF verticals use highest-Q tuning circuits (not lossy traps!) to outperform all multiband designs of comparable size!

Model HF6V

- 80, 40, 30, 20 15 and 10 meters automatic bandswitching.
- Add-on kit for 17 and 12 meters available now.
- 26 ft. tall

Model HF2V

- Designed for the low-band DXer
- Automatic bandswitching on 80 and 40 meters
- Add-on units for 160 and 30 or 20 meters
- 32 feet tall - may be top loaded for additional bandwidth.

For more information see your dealer or write for a free brochure

BUTTERNUT ELECTRONICS CO.
405 East Market, Lockhart, TX 78644

SATELLITE CITY

Communications for the Future

• Dan "KBØXC" • Dave "WBØSNM"
• Denise "YL" • Maline "XYL"
• Dan E "SØØN" • Louis "KAØIPN"

YAESU

FT-2311
1.2 GHz. Mobile
Holiday Special!

FT-747
Holiday Special!

New!
In Stock Butternut Antennas

Books are a great Christmas gift!

EQUIPMENT

Duplex	1579.95 Call
	899.95 Call
	44.95 Call
	29.95 Call
	95 Call
FP-75	5 Call
FC-75	5 Call
SP-9	5 Call
FT-76	5 Call
MH-1	
Ant-tun	
6M/767	95 Call
2M/767	9.95 Call
430/767	49.95 Call
440/767	49.95 Call
RECEI	
FRG-8800 .150–30 MHZ	59.95 Call
FRV-8800 118–174 MHZ CNV	129.95 Call
FRA-7700 ACTV	59.95 Call
FRT-7700 A	64.95 Call
FRG-9600	699.95 Call
VU-9600 N	25.00 Call
SP-55 Remot	24.95 Call
H	
FT23R	99.95 Call
FT23R/TT	94.95 Call
FT 33R 2	1.95 Call
FT-33R	95 Call
FT-73	5 Call
FT-73	Call
FTT4	Call
FTS1	Call
NC29	5 Call
FNB1	95 Call
FNB11	.95 Call
FBA10	2.95 Call
FT109 RH	399.95 Call
FT 209 RH	389.95 Call
FT 709 RH	389.95 Call
FT 727 Dua	439.95 Call
FNB-3/A	49.95 Call
FNB-4A/A	64.95 Call
NC15 Quick Charger	89.95 Call
PA3 Mobile Adapter	39.95 Call
FTS CTCSS Unit	49.95 Call
MOBILE/PORTABLE	
R All Mode	599.95 Call
Mode	589.95 Call
	799.95 Call
F	TBA Call
F	389.95 Call
F	429.95 Call
F	95 Call
NCO	
ALR-22T 2	
ALR-22 HT 2m	
ALR-72 HT 400 MH	
ALD-24T Dual Band	
AL8-2T 2m	
ELH 230G 2 MTR Amp	
ELH 230D 2 MTR Am	
ELH 260D 2 MTR 50	

ARRL BOOK LI

1-800-426-2891
METRO 612-754-1200
HOURS M–F 10-8 Sat 10-5

Prices subject to change and availability.
12581 Central Ave. N.E., Blaine, MN 55434

CIRCLE 332 ON READER SERVICE CARD

 Continued from page 30

A full-function computer has diskette drives, which gives us lots of memory for all kinds of functions. Whenever the repeater program starts, it accesses the diskette, and read these parameters into the computer's memory for instant access. Since these parameters are stored in a file on diskette, they are easily saved and duplicated.

An even bigger advantage to storing the user programmed parameters in this manner is that they can be stored in human readable form. Here are some examples of how the parameters appear in the file for this repeater controller:

TR = 3
TP = 10
123 = 5552345
911 = 5550987
TI = KF5WO/R

This data tells us (and the repeater controller program) that the time limit for the repeater (TR) is three minutes, that the time limit for the phone patch (TP) is 10 minutes, that the speed-dial code 123 calls the number 555-2345, and that the emergency speed-dial code 911 calls 555-0987. The last line defines the tone identification (TI) used by the repeater.

You can create and change this parameter file by using any computer (including the repeater controller) and a text editor. Keep records of the file just by printing it out. This is best for major changes, or when initially setting up the controller. Alternatively, you may change the parameters from a remote location, while the repeater is operating, via one modem in the repeater computer and another modem at the distant location (at home, for example).

A control operator at home, using a terminal program on any computer, can dial up the phone at the repeater site. The repeater control computer's modem answers the phone, establishes communications, and permits the operator to set any desired parameter or phone number, or just check existing parameters. For example, the control operator can see all parameters by typing "?". He can get instructions on how to change parameters by typing "HELP". To prevent hackers from disrupting the repeater, a password is required at startup.

The Controller Program

Repeater controlling software must operate in what is called "real-time." This means that external events, which may happen at any time, must be watched and action must be taken immediately following these external events. In addition, the software must perform functions, such as generating Morse code IDs, which require precise timing. A block level flowchart of the program is shown in Figure 4.

The software used here is clock driven. This means that all inputs are read and all outputs are performed on the tick of a clock. This way, we are assured that all inputs are regularly monitored and that actions can be timed accurately. Of course, we need a clock that ticks more than once per second, or we could miss external events (such as a DTMF tone). The IBM PC (and all compatibles) has a clock that ticks approximately 18 times per second, and which can be read by a program by doing a BIOS function. BIOS stands for "basic input output system." It is software built into the computer to provide a standard software interface to devices, such as the printer, screen, and keyboard. For example, it allows software to send text to the screen, regardless of the type of display adapter and installation.

Timing events of any length is accomplished by using a program variable, which is incremented or decremented at each tick of the 1/18-second clock. For example, counting to 180 would take the program 10 seconds, if one count is done at each clock tick.

Most of the time, the program is just sitting and watching this clock. When the clock ticks (indicated by a change of time read via BIOS), the software goes into action.

The Clock Strikes 1/18... Dead-man Timer

The first thing that the software does is toggle (change the state of) one of the printer port output lines to re-trigger the 74LS123 one shot, or dead-man timer. If this one shot was not triggered regularly, it would time-out, shutting down the transmitters and hanging up the phone. This protects us from any computer or software failure which might otherwise leave the repeater on the air, but out of control.

Inputs

Next, the input lines are sampled. These lines are tied to the receiver squelch and the DTMF tone decoder. If any of these lines change state from the last sample (their old state is stored), software "flags" are set. Software flags are simply variables which are either a 0 (meaning off) or a 1 (meaning on). These flags will be examined later in this timing step, when decisions must be made. They are always cleared at the end of each timing step, and before the input lines are sampled at the next 1/18 second tick.

Throat Clear?

At each timing step, another software flag, the "speech-in-progress" flag, is tested to determine if any speech is underway. This is necessary because many phrases we want to say are made up of more than one word or sound from the speech synthesizer. We must therefore queue up the words while the software goes about other things. If speech is indeed under way, the speech adapter is checked to see if it is still busy with the last word we told it to say. If it is busy, we must wait.

If, however, the speech adapter is idle, the software goes to the speech queue, gets the next word, and commands the speech adapter to begin speaking that word. If the speech queue is empty, the "speech-in-progress" flag is cleared.

Making It Talk

As described earlier, the PC Convertible Speech Adapter is used in the canned speech mode. This mode works in the "background," thus allowing the computer to resume normal repeater control once speaking begins. It is limited to 200 sounds in this mode, not all of which are useful in repeater operation. Making it say these words is easy, however. You must write a program to send the Speech Adapter "BIOS calls." This is similar to the BIOS call to read the computer's clock, described previously. The Speech Adapter contains its own BIOS, which allows the following three computer assembly instructions to make it say "DANGER:".

```
MOVBX,09
MOVAX,0201H
INT4DH
```

Here 09 is the number representing the word "danger," 0201H is the hex number meaning "say it now," and the first two instructions place these numbers into the microprocessor's registers. The third instruction is a software interrupt, causing the execution of a program contained in ROM in the speech adapter.

Code ID?

Morse code IDs are generated by software turning the DTMF generator on and off, timed to create dots and dashes. The DTMF generator is programmed to generate single tones, instead of the dual tones normally used for phone dialing. A "code-in-progress" flag is set whenever a Morse code ID is in progress. Morse code characters are queued up in a manner similar to the speech words, and are pulled out by software as the previous character is completed. A lookup table in the program data area is used to convert the characters to the proper series of dits and dahs.

Phone Number?

At each timing step, the DTMF decoder input flags are examined to determine if a valid tone pair has been detected. If so, this tone is queued up, and the "valid tone" flag is set. For privacy, it is desirable to prevent these tones from passing to the transmitter, but in this design, the first tone is allowed to pass. This is because, at times, many voices might sound briefly like DTMF tones. If a second valid tone is not detected within a two-second period after the first, the software assumes that the detected tone was an error, and allows voice to continue (and empties the queue).

If a second valid tone is detected, the audio path to the transmitter is shut off, preventing the tones from being re-broadcast. If no more tones are detected for five seconds, audio is restored and the queue is emptied.

Valid tones are accumulated in the queue as long as the repeater controller detects a valid carrier. When the operator entering the tones releases his key, the tones (representing numbers and other symbols from the tone pad) are examined for meaning. If the number sequence received matches an operator

Continued on page 92

uniden®

$12,000,000 Scanner Sale

Uniden Corporation of America has purchased the consumer products line of Regency Electronics Inc. for $12,000,000. To celebrate this purchase, we're having our largest scanner sale in history! Use the coupon in this ad for big savings. Hurry...offer ends December 31, 1988.

★★★ **MONEY SAVING COUPON** ★★★

COUPON COUPON

Get special savings on the scanners listed in this coupon. This coupon must be included with your prepaid order. Credit cards, personal checks and quantity discounts are excluded from this offer. Offer valid only on prepaid orders mailed directly to Communications Electronics Inc., P.O. Box 1045 – Dept. UNI11, Ann Arbor, Michigan 48106-1045 U.S.A. Coupon expires December 31, 1988. Coupon may not be used in conjunction with any other offer from CEI. Coupon may be photocopied. Add $9.00 for shipping in the continental U.S.A.

Regency TS2-T $259.95
Regency INF1-T $119.95
Regency INF5-T.....$79.95
Regency R1090-T.....$114.95
Regency UC102-T $109.95
Regency RH606B-T.....$419.95
Regency RH256B-T.....$294.95
Bearcat 200XLT-T $249.95
Bearcat 100XLT-T $184.95
Bearcat 800XLT-T $249.95
Uniden TALKER-T $179.95

COUPON COUPON

★★★★ **VALUABLE COUPON** ★★★★

NEW! Bearcat® 760XLT-T

List price $499.95/CE price **$244.95/SPECIAL**
12-Band, 100 Channel • Crystalless • AC/DC
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 760XLT has 100 programmable channels organized as five channel banks for easy use, and 12 bands of coverage including the 800 MHz. band. The *Bearcat* 760XLT mounts neatly under the dash and connects directly to fuse block or battery. The unit also has an AC adaptor, flip down stand and telescopic antenna for desk top use. 6-5/16" W x 1⅝" H x 7⅜" D. Model **BC 590XLT-T** is a similar version without the 800 MHz. band for only $194.95. CTCSS squelch option now available.

SALE! Regency® TS2-T

List price $499.95/CE price **$269.95/SPECIAL**
12-Band, 78 Channel • Crystalless • AC/DC
Frequency range: 29-54, 118-175, 406-512, 806-950 MHz.
The *Regency* TS2 scanner lets you monitor Military, Space Satellites, Government, Railroad, Justice Department, State Department, Fish & Game, Immigration, Marine, Police and Fire Departments, Aeronautical AM band, Paramedics, Amateur Radio, plus thousands of other radio frequencies most scanners can't pick up. The *Regency* TS2 features new 40 channel per second *Turbo Scan*™ so you wont miss any of the action. Model **TS1-T** is a 35 channel version of this radio without the 800 MHz. band and costs only $199.95.

Regency® RH256B-T

List price $799.95/CE price **$299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority
The *Regency* RH256B is a sixteen-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to 16 frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH256 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH606B-T** is available for $429.95. A UHF 15 watt, 16 channel version of this radio called the **RU156B-T** is also available and covers 450-482 MHz. but the cost is $454.95.

★★★ *Uniden* CB Radios ★★★

The *Uniden* line of Citizens Band Radio transceivers is styled to compliment other mobile audio equipment. Uniden CB radios are so reliable that they have a two year limited warranty. From the feature packed PRO 810E to the 310E handheld, there is no better Citizens Band radio on the market today.

PRO310E-T *Uniden* 40 Ch. Portable/Mobile CB...$83.95
PRO330E-T *Uniden* 40 Ch. Remote mount CB...$104.95
PRO500D-T *Uniden* 40 Channel CB Mobile $38.95
NINJA-T PRO310E with rechargeable battery pack.$99.95
B10-T 1.2V AA Ni-cad battery for Ninja (set of 10)...$20.95
KARATE-T *Uniden* 40 channel rescue radio $53.95
PRO510XL-T *Uniden* 40 channel CB Mobile.....$38.95
PRO520XL-T *Uniden* 40 channel CB Mobile.....$56.95
PRO540E-T *Uniden* 40 channel CB Mobile.....$97.95
PRO640E-T *Uniden* 40 channel SSB CB Mobile ...$137.95
PRO710E-T *Uniden* 40 channel CB Base $119.95
PRO610E-T *Uniden* 40 channel SSB CB Base ...$174.95

★★★ *Uniden* Radar Detectors ★★★

Buy the finest *Uniden* radar detectors from CEI today.
TALKER-T *Uniden* talking radar detector.....$184.95
RD7-T *Uniden* visor mount radar detector $99.95
RD9-T *Uniden* "Passport" size radar detector $114.95
RD9XL-T *Uniden* "micro" size radar detector $144.95
RD25-T *Uniden* visor mount radar detector.....$54.95
RD500-T Uniden visor mount radar detector.....$74.95

Bearcat® 200XLT-T

List price $509.95/CE price **$254.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-T** for only $189.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-T

List price $549.95/CE price **$259.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-T** is available for $178.95.

Bearcat® 145XL-T

List price $189.95/CE price **$94.95/SPECIAL**
10-Band, 16 Channel • No-crystal scanner Priority control • Weather search • AC/DC
Bands: 29-54, 136-174, 406-512 MHz.
The *Bearcat* 145XL is a 16 channel, programmable scanner covering ten frequency bands. The unit features a built-in delay function that adds a three second delay on all channels to prevent missed transmissions. A mobile version called the **BC560XLT-T** featuring priority, weather search, channel lockout and more is available for $94.95. CEI's package price includes mobile mounting bracket and mobile power cord.

Regency® Informant™ Scanners

Frequency coverage: 35-54, 136-174, 406-512 MHz.
The new *Regency* Informant scanners cover virtually all the standard police, fire, emergency and weather frequencies. The **INF1-T** is ideal for truckers and is only $129.95. For base station use, the **INF5-T** is $84.95. Order your scanner today.

NEW! President® HR2510-T

List price $499.95/CE price **$239.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Auto Squelch RIT • Preprogrammed 10 KHz. Channels
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
The *President* HR2510 Mobile 10 Meter Transceiver made by Uniden, sets a new standard in amateur radio communications. Fully Featured-The HR2510 has everything that you need. Up to 25 Watt PEP USB/LSB and 25 Watt CW mode. Noise Blanker. PA mode. Digital VFO. Built-in S/RF/MOD/SWR meter. Channel switch on the microphone, and much more! The HR2510 lets you operate AM, FM, USB, LSB or CW. The digitally synthesized frequency control gives you maximum stability and you may choose either pre-programmed 10 KHz. channel steps, or use the built-in VFO for steps down to 100 Hz. There's also RIT (Receiver Incremental Tuning) to give you perfectly tuned signals. With receive scanning, you can scan 50 channels in any one of four band segments to find out where the action is. Order your HR2510 from CEI today.

BC760XLT
800 MHz. mobile scanner
SPECIAL!

★★★ Facsimile Machines & Phones ★★★

If you need an excellent facsimile machine, CEI has the full featured Faxtel 3300 fax by Pactel at a special price.
FAX3300-T *Pactel* Fax machine with phone $1,099.95
XE750-T *Uniden* Cordless Phone with speaker....$99.95

★★★ Extended Service Contract ★★★

If you purchase a scanner, CB, radar detector or cordless phone from any store in the U.S. or Canada within the last 30 days, you can get up to three years of extended service contract from Warrantech. This service extension plan begins *after* the manufacturer's warranty expires. Warrantech will perform all necessary labor and will not charge for return shipping. Extended service contracts are not refundable and apply only to the original purchaser. A two year extended contract on a mobile or base scanner is $29.99 and three years is $39.99. For handheld scanners, 2 years is $59.99 and 3 years is $79.99. For radar detectors, two years is $29.99. For CB radios, 2 years is $39.99. For cordless phones, 3 years is $34.99. Order your extended service contract today.

OTHER RADIOS AND ACCESSORIES

BC55XLT-T *Bearcat* 10 channel scanner $114.95
BC70XLT-T *Bearcat* 20 channel scanner.....$159.95
BC175XLT-T *Bearcat* 16 channel scanner $156.95
R1090-T *Regency* 45 channel scanner.....$119.95
UC102-T *Regency* VHF 2 ch. 1 Watt transceiver...$114.95
BPS5-T *Regency* 16 amp reg. power supply.....$179.95
MA549-T Drop-in charger for HX1200 & HX1500 .....$59.95
MA518-T Wall charger for HX1500 scanner $14.95
MA553-T Carrying case for HX1500 scanner.....$14.95
MA917-T Ni-Cad battery pack for HX1000/1200 ....$39.95
BP205-T Ni-Cad batt. pack for BC200/BC100XLT ...$49.95
B8-T 1.2 V AA Ni-Cad batteries (set of eight).....$17.95
FBE-T Frequency Directory for Eastern U.S.A.....$14.95
FBW-T Frequency Directory for Western U.S.A. $14.95
ASD-T Air Scan Directory.....$14.95
SRF-T Survival Radio Frequency Directory $14.95
TSG-T "Top Secret" Registry of U.S. Govt. Freq....$14.95
TTC-T Tune in on telephone calls.....$14.95
CBH-T Big CB Handbook/AM/FM/Freeband.....$14.95
TIC-T Techniques for Intercepting Comm. $14.95
RRF-T Railroad frequency directory $14.95
EEC-T Embassy & Espionage Communications....$14.95
CIE-T Covert Intelligence, Elect. Eavesdropping ...$14.95
MFF-T Midwest Federal Frequency directory.....$14.95
A60-T Magnet mount mobile scanner antenna.....$35.95
A70-T Base station scanner antenna $35.95
A500-T 10 & 11 Meter – 500 Watt antenna.....$38.95
A1300-T 25 MHz.–1.3 GHz Discone antenna.....$109.95
USAMM-T Mag mount VHF ant. w/ 12' cable $39.95
USAK-T ¾" hole mount VHF ant. w/ 17' cable $35.95
USAK450-T ¾" hole mount UHF ant. w/ 17' cable.....$35.95
Add $4.00 shipping for all *accessories* ordered at the same time. Add $9.00 shipping per radio and $4.00 per antenna.

BUY WITH CONFIDENCE

To ***get the fastest delivery from CEI*** of any scanner, send or phone your order directly to our Scanner Distribution Center.™ Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CEI is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. CEI warehouse in Ann Arbor, Michigan. No COD's. Most items listed have a manufacturer's warranty. Free copies of warranties on these products are available by writing to CEI. Non-certified checks require bank clearance. Not responsible for typographical errors.

Mail orders to: Communications Electronics,™ Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $9.00 per scanner for U.P.S. *ground* shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are three times continental U.S. rates. If you have a Discover, Visa, American Express or Master Card, you may call and place a credit card order. 5% surcharge for billing to American Express. Order toll-free in the U.S. Dial 800-USA-SCAN. In Canada, dial 800-221-3475. FAX anytime, dial 313-971-6000. If you are outside the U.S. or in Michigan dial 313-973-8888. Order today.

Scanner Distribution Center™ and CEI logos are trademarks of Communications Electronics Inc.
Sale dates 10/15/88 — 12/31/88 AD #110188-T
Copyright © 1988 Communications Electronics Inc.

For credit card orders call 1-800-USA-SCAN

COMMUNICATIONS ELECTRONICS INC.™

Consumer Products Division
P.O. Box 1045 □ Ann Arbor, Michigan 48106-1045 U.S.A.
For orders call 313-973-8888 or FAX 313-971-6000

CIRCLE 121 ON READER SERVICE CARD

CES *continued from p. 14*

to the phone line. A six-foot cable with a modular plug comes with the unit.

There are two circuits in this unit not found in many autopatches. One is a VOX circuit that detects when the person on the phone is talking. This varies the sample rate in simplex operation. A noise-operated squelch simplifies connection to the radio receiver. No COR input is needed, just raw non-deemphasized audio straight from the discriminator. A provided CTCSS input can be used as a COR input though, if you'd rather connect it that way.

An audio AGC circuit equalizes the audio level between the phone line and the transmitter.

To minimize possible noise problems, digital and audio circuits are separated on the PC board. One side is digital, the other, audio, with separate voltage regulators for each side.

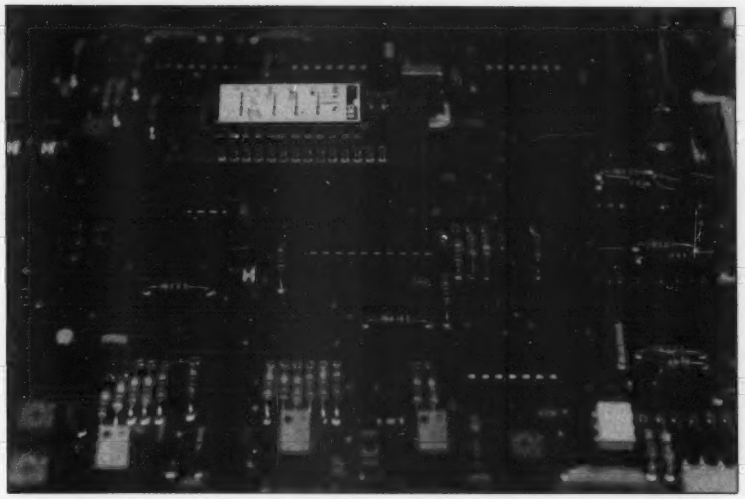


Photo C. View of the piggy-back MOSTEK microprocessor with the touchtone decoder. "Tone Decoded" LED is in the foreground.

The Manual

The present manual is basically well written, but falls short in a few areas. Some function descriptions aren't detailed enough. For example, the manual doesn't explain about the CTCSS control input being used as a COR input. Neither does the manual explain why there are three different letter A's in the CW programming chart. There are other redundant letters in the chart. When I called CES (they have a toll free number!) I was told that those letters are for foreign language use. One letter A was supposed to have two dots above it. Another A should have been printed with a bar above it, and so on with the other extraneous letters. Also, repeater controller operation is barely mentioned. The folks at CES assured me that a new manual is being prepared, and should be out by the time this review appears in print.

Setup

You can program the Smartpatch and set its levels only after the patch is fully connected to the transmitter, receiver, and phone line with which the unit is to be used.

Programming both the jumpers and the onboard EEPROM memory was not difficult. Most, but not all, of the jumpers are the pin and jumper block type. JP1 was a little tricky to find—it turned out to be a wire soldered between two holes in the board.

The programming section of the manual appears a bit intimidating at first, but once you get started it's not bad at all. There are plenty of examples to help you with the codes. Plus, all parameters have preprogrammed default values in case you miss something.

It's best to go through the manual and write down all of the programming codes you'll use first so that they can be entered easily once you start. There are timers that limit the time an entry may take, so it's good to have them worked out on paper beforehand.

EEPROM programming can be done locally with the supplied DTMF decoder or remotely via phone line. I enjoyed this part! The patch beeps every couple of keystrokes to let you know you're proceeding properly. If you make an erroneous entry, it sends you an understandable CW error message.

Setting audio levels properly is a little harder. The writer of the instruction manual assumes that you have on hand an FM service monitor or the combination of a deviation monitor, an audio generator, and an oscilloscope. Although I have the equipment, I tried setting it up by ear. I had everything sounding pretty good, I thought, until I actually tried to make a phone patch call and I couldn't make it work. The phone line wouldn't accept the digits I was dialing. I had to use an oscilloscope to set the level from the receiver into the patch, and the audio level into the phone line.

It took me less than an hour to get operational the first time, and that includes wiring everything together!

Operation

I tested the patch in two different settings. First I tried it in simplex mode with my ICOM IC-245 synthesized two meter transceiver. Then I tried it as a repeater controller and autopatch with a 220 MHz Motorola MICOR based repeater.

In both modes of operation, the patch offers the standard timeout and activity timers, toll restrict, toll restrict override controls, and reverse patch operation.

The connect and disconnect codes can either be the standard * up and # down, or programmable three-digit codes.

Toll restrict can be programmed to work on either the first or second digit dialed. Both digits are programmable. Toll restrict can be totally enabled or disabled, or you can enter a special override code which allows you to make one toll call. After disconnect, it automatically rearms.

Simplex Operation

In simplex mode, the patch worked well with my synthesized ICOM. The default sample window time of 60 ms was more than adequate. I was even able to reduce it to 25 ms with the rig in low power mode.

The constant "kerchunks" I had to listen through when using the patch with a synthesized rig bothered me, but this patch senses when the person on the phone is talking (the VOX circuit) and slows down the sample rate so that the kerchunks are not as frequent when you're trying to listen. The patch samples in between syllables rather than words, and the sample rate changes and slows down between pauses. Dial tone and other telephone signals won't fool it, thanks to the call progress tone filter in the DTMF decoder.

If a crystal-controlled rig had been used with a shortened squelch time constant, the "kerchunk" would have been reduced to a less bothersome "click."

Repeater Operation

With the patch connected to my repeater, I learned its repeater controller functions. There is a transmitter timeout timer and an ID interval timer that must be set, in addition to the autopatch timers. If the Auto ID mode is activated, the repeater call must be programmed into memory as well. A single, non-programmable, courtesy beep can be enabled or disabled. It has an associated programmable "PTT Delay" timer for keeping the transmitter up after the beep.

There is also an autopatch enable control that allows the control operator to enable or disable the autopatch function without affecting its operation as a repeater controller.

The unit has two functions for turning on and off external devices, but strangely, they are not brought to the outside world. CES plans to include an addendum in future manuals that will show you how to access these functions.

Since I had the repeater connected to my home phone line while I tested the patch, I especially appreciated one feature of the patch—it won't allow an interconnect if the phone line is already busy. This is great when your repeater is located in your home and your wife is using the phone. She won't get a rude earful of touchtones from someone attempting to make an autopatch call, nor will her

conversation suddenly end up on the air. This is a definite marriage saver! If you're not married or don't care, you can use the jumper provided to defeat this feature.

Reverse Patch

There are two modes of reverse patch operation. The first is "Auto Answer" mode. In this mode, the patch will answer the phone after a preprogrammed number of rings and wait a preprogrammed time for further control codes.

The caller can then enter a remote programming code, or a multi-digit security code. If the correct security code is entered, the patch will immediately connect to the phone line. If neither the programming code nor the immediate connect security code is entered, or if the channel is not busy, the transmitter then regenerates part of the security code. A designated mobile can then complete the connection by dialing in the same code that was transmitted to him.

In the "Non-auto Answer" mode, the patch senses the phone ringing and generates a long beep out over the air. Anyone can then answer the phone by just dialing the regular connect code.

In either reverse patch mode, the patch monitors the receiver and will not allow itself to bring up the transmitter when it senses a signal already on frequency. If a signal *is* on frequency, the person calling on the phone line hears an error message and the call is then terminated. Software allows you to defeat this feature.

Opinion

This patch performs excellently. Its audio quality is excellent. Programming is flexible and is easily done remotely. I suggest below, however, a few improvements.

First, the instruction manual needs some elaboration in certain areas. Second, CES should consider putting a decent connector on the rear of the unit, and labelling the connector terminals. The terminal block on this patch is on the circuit board inside the unit, requiring cover removal for wire connects/disconnects. You also have to refer to a diagram in the manual and then count positions to find the right terminal.

Third, CES should move to the front panel an LED on the PC board that indicates when a DTMF tone is decoded. In a DTMF-dependent device such as this, a "tone decoded" indicator is as important to monitor as a NOISE or PTT indicator.

Fourth, there should be automatic stop-bit insertion. When I programmed in my call letters, I forgot to also program in a stop bit as mentioned in the manual. This caused several extraneous characters to be sent after my call. Though easily corrected, there's no reason why internal software can't automatically insert the stop bit when one exits the programming mode, to completely avoid this snag.

Fifth, though the unit contains the circuitry capable of doing this, it doesn't regenerate touchtones into the phone line. The patch stores the phone number and redials it as pulses, but not as touchtones. A slight software change here can eliminate one of the bigger headaches in autopatchdom?

In Sum

The above comments fall in the category of nitpicks. The CES 510SA-II telephone interconnect is an excellent autopatch and repeater controller, from a company with an excellent reputation. Before doing this review, I had heard nothing but good reports from friends who own this model. Now that I've had the chance to test one myself, I can say that if you're looking for a good mid-featured autopatch/repeater controller, the Smartpatch II from CES is an excellent choice. 73

CES 510SA–II Specifications

Modes of Operation:	Simplex, half, or full duplex
Connect/Disconnect Codes:	* & # or three digit codes
Simplex Sample Window:	Variable 2ms–512ms
Simplex Sample Rate:	100ms–3.000ms
Call Limit Timer:	up to 42 minutes
Activity Timer:	up to 4 minutes
Rptr Timeout Timer:	up to 16.6 minutes
Rptr Hang Time:	up to 9.99sec
Timeout Warnings:	10 seconds of warning beeps
Toll Restrict:	1st or 2nd digit programmable
Automatic Ring Out:	General or Directed
Toll Restrict Defeat:	Three digit code
Automatic CW ID:	Five programmable
Dialing:	DTMF or pulse. Europulse DTMF not regenerated
Phone Busy Lockout:	User selectable option
Busy Chan. Xmit Lockout:	User selectable option
User Control output:	MOSFET drain pulling to ground
Remote Disable:	Rear connection
CTCSS Enable - Disable:	Rear connection
Audio Requirements:	
Input:	50–2000mV RMS
Output:	0–1 V RMS
Interface Signals Req'd:	Ground, +12V, PTT, Tx audio rcvr discriminator audio Telephone tip & ring
Programming:	Locally via supplied DTMF keypad, or remotely via phone line
Dimensions:	8.25 x 1.5 x 9.5"
Weight:	3lbs., 13oz.
Power Requirements:	10–15 VDC at 300mA

Table 1.

Full-duplex, Half-duplex, Simplex?

These terms refer to the way the repeater or autopatch handles audio information. **Full-duplex** means that audio passes into and out of the phone patch at the same time. A normal land-line telephone operates full-duplex because one can talk and listen simultaneously. A repeater is a full-duplex system because it receives and transmits simultaneously. A full-duplex autopatch allows you to talk and listen simultaneously.

Half-duplex means that information flows in only one direction at a time, even if the transmit path is on a different frequency from the receive path. Most radio transceivers are half-duplex devices. You can either transmit or receive, but not both simultaneously. Most autopatch systems operate in half-duplex mode, not because the repeater and autopatches can't receive and transmit simultaneously, but because the users can't.

Simplex operation refers to the fact that both transmitting and receiving take place on the same frequency, but not simultaneously. You need only a transceiver for this, not a repeater. A simplex autopatch, after activation, transmits the audio coming from the phone line. Every second or so, the simplex autopatch switches the transceiver from transmit to receive for a very brief time, typically 25–75 milliseconds. If a signal is received during this "sample window", the autopatch will hold the transceiver in receive mode until the signal ends, at which time the transceiver will be switched back to transmit mode.

A station listening to a simplex autopatch will hear the person on the phone line interrupted by a "click" every second or so. That's the sample window. To capture the receiver, the transmitting station must hold his transmitter on until a sampling occurs. Then he can talk to the person on the phone. Though it doesn't have the interactivity of a normal phone conversation, and has the annoying sampling interrupts, it gets the job done using only one frequency, and doesn't require a repeater. Anyone who has a transceiver can have his own autopatch. Be sure to check out the FCC regulations pertaining to simplex operation before putting such a system on the air.

73 Book Review

Wishbook of Circuits

Circuits for QRP, signal generators, and much, much more.

reviewed by Larry Antonuk WB9RRT

Master Guide to Electronic Circuits
by Harry L. Helms
Published by Prentice-Hall
Englewood Cliffs, NJ 07632
Hardbound, 293 pages, illustrated, 1988

The latest entry in the "circuit compilation/wishbook" category comes from Harry Helms. *Master Guide to Electronic Circuits* is a collection of electronic schematics, each backed up with a short paragraph of explanation. This type of book is quite useful for the person searching for a specific type of circuit. The original source is listed with each circuit, so the builder can go back and find PC board layouts, pictorials, etc. The book also fits the casual reading category—nice for browsing through, for thinking that well, someday, I'd sure like to build one of *those*.

The circuits contained in the *Master Guide* are drawn from several sources. Most of the information comes from manufacturer's data sheets and application notes. Hams will like the fact that the remainder of the circuits come from *73*, *CQ*, *Ham Radio*, and *QST*. As a matter of fact, these are the only magazines that the author drew from. This makes for a pleasing absence of Flashing-LED and Freezer-Failure-Alarm circuits.

In addition to the expected signal generators and QRP transmitters, though, we do have enough variety to make things interesting. The strong of heart can whip up their own Computer Modem or Bicycle Mileage Computer. Part-time medical doctors might want to build an Electrocardiograph Amplifier, or perhaps a Heart Rate Monitor. Or how about Automatic Cruise Control? You name it, it's probably in there.

The graphics in *Master Guide to Electronic Circuits* are quite good. The preface lets us know that the schematics don't all match one another because they are still in the style used by each publisher. While this comes across as a light apology, it's actually stating a strong point. Using material directly from the source eleminates another step in the process that could easily introduce errors.

Master Guide, being a good collection of the most current electronic circuits, is a source of inspiration. Used in conjunction with the originally published material, it will save the builder hours of research time.

Ham Radio & Computer EXPO '88
presented by
THE ALFORD MEMORIAL RADIO CLUB
of Stone Mountain
November 5 & 6, 1988
Gwinnett County Fairgrounds
Lawrenceville, Georgia
Just 20 minutes Northeast of Atlanta

Large Indoor Dealer Area
Concession Stands
RV-Sites with Hook-ups
24 Hour Security
Cookout Saturday Night

VEC EXAMS BOTH DAYS!
Talk-In W4BOC 146.16/76

$5.00 ADMISSION **FREE PARKING**

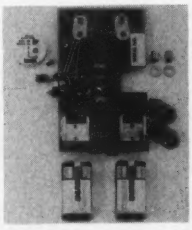
FOR MORE INFO CONTACT:
EXPO '88
P. O. Box 1282
Stone Mountain, GA 30086

NEW

New Mod Kit for Bird Model 43 Wattmeter

MEASURES PEAK POWER OF SSB AND OTHER AM SIGNALS

Bird Model 4300-400 modification kit quickly adapts any Bird Model 43 Wattmeter to measure audio peak power of single sideband and other AM modulated signals.



The 4300-400 kit pc board mounts inside the Model 43 housing, on the meter studs. Estimated conversion time is only 15 minutes from start to finish.

Once modified, you can measure peak power to an 8% F.S. accuracy, without affecting cw operation or accuracy.

And, the Model 4300-400 is surprisingly inexpensive. Contact your Bird distributor or factory for details.

BIRD
Electronic Corporation

30303 Aurora Rd., Cleveland (Solon), Ohio 44139 — 2794
216-248-1200 TLX: 706898 Bird Elec UD FAX: 216-248-5426
WESTERN REGION OFFICE:
Bird Electronic Corp.
621 Ojai Ave., Suite F, P.O. Box 28, Ojai, CA 93023 805-646-7255

CIRCLE 176 ON READER SERVICE CARD

KEEP IT INSIDE

- **Frequency Range** - 13 MHz to 30 MHz
- **Power Limit** - 1500 Watts P.E.P.
- **Diameter** - 39 inches
- **Wind Survival** - 70 + MPH
- **Surface Area** - < .89 Sq. Ft.
- **Antenna Finish** - Heat Shrink Tubing
- **Coax Connector** - PL-259
- **Antenna Weight** - 4 lbs.
- Magnetic Design Maximum Efficiency
- 100% Copper One Piece Construction
- Military Spec Vacuum Variable Capacitor Rated at 35,000 Volts
- Hi-Q Harmonic Supression
- All Locations - Indoors or Outdoors
- Bi-Directional at 0-20 Degrees TOA
- Omni-Directional at 25-90 Degrees TOA
- High Signal to Noise Ratio
- Direct Feed 52 OHM Coax SWR < 1.5:1
- No Matching Unit, Pretuned Coax, Ground Screen or Radial System

WA2VMO A BELIEVER

WHEN YOU'RE TOLD YOU CAN'T — THE DMQ-5588 SAYS YOU CAN

OPERATION: Apply power to DMQ-5588 and adjust vacuum variable for lowest SWR.

INSTALLATION: DMQ-5588 inside ground floor apartment brick building 100W.

DX CONTACTS MADE BETWEEN 3/88 TO 5/88: 5Z4 P43 PA0 TK9 DJ8 GW0 CP5 YS9 ZS6 J37 ZD8 HP9 WP4 IK4 HK6 GM4 I5 EA5 JH1 C6 HK6 IK2 GD4 PJ2 HP4 CE1 5Z4 5T5 KP4 UT4 SP3 CP3 F9 IK3 N91 UA6, UR2 UP1 YT2 UB5 IV3 EA5 TG9 GJ5 ON7 YU1 V01 DL6 J73 PY8 TI2 LZ1 PY5 OE4 GI0 G4 WP4 KL7

Become a Believer! For more information about this exciting new antenna, call or write DMQ today! Limited time intro offer: $349.50. + Shipping.

221 Slater Boulevard
Staten Island, NY 10305
(718) 979-3505

D3Q TECHNOLOGY

CIRCLE 360 ON READER SERVICE CARD

WEATHERFAX → PC

Receive & Transmit AM/FM Radio Faxcimile
View Satellite Image on Graphic Display
Zoom and Pan Around Image
Print to Epson (IBM) Compatible Printer
Works with Hercules, CGA, EGA Monitors
Plug In Board for IBM PC or Compatible

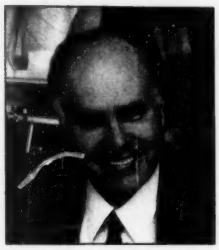
$599.00

COMPUMAX

26 W. Boylston St.
W. Boylston, MA 01583
(617) 835-2722

CIRCLE 80 ON READER SERVICE CARD

Getting Rich In The Ham Market



Every time two hams get together at least one says how about if we were to make this great product to sell to hams—not realizing that the ham "industry" is probably one of the best possible ways to guarantee poverty.

No, not all hams are cheap—not all are living on starvation retirement payments—the fact is that some ham firms are doing remarkably well selling to those few hams who are alive and well—and to the handful of newcomers who blunder into our hobby.

The whole trick to survival in the ham market is in getting your sales message to your potential customers—this is called marketing. Marketing includes making sure your literature is as good as (or even better than) your product—and that your sales pitch reaches those few live hams who are your best potential customers.

I'll bet you thought I was never going to mention *73*. Advertising is going to be one of your biggest sales expenses, so give it the serious thought it rates. Advertising is a very well-developed art—billions have been spent on research to find out what works and what doesn't. Indeed I'm working on a video just on how to advertise. In the meantime, if you can take it, I'll mercilessly criticize your literature and your ads—a service no other ham magazine can provide at any price because none of them have anyone with anything even remotely like the 35 years I've had in advertising to hams. Unless you fall into it, it's unlikely you're going to find an ad agency able to help you sell to hams—which is, to be kind, a unique group.

Presuming that sales are of some importance to you, where do you think you'll do best? There are four ham magazines—one for advanced builders—one for contest fanatics—one for ARRL fans—and then there's *73*—which appeals to active hams with small construction projects, with the only world DX column, with columns and news about all of the new ham activities such as packet, RTTY, Oscar and so on. The *73* readers buy circles around other magazine readers because they're active and motivated.

So if you decide to try and fight the odds with a ham product, give it your best shot with *73*—and let me help you win with powerful, sales-oriented literature and ads. A little mail order business at home is a great way to become independent—millions are doing it. Remember, small business is the real strength of America . . . and it's about the only practical way to have a crack at making big money these days.

Write or call the *73* advertising people—Richard, Ed, or Jim—and let's get you started with power ads which will make you money.

. . . Wayne
W2NSD/1

73 Amateur Radio
WGE Center
Peterborough, NH 03458
(603) 525-4201

Kenwood 4100A Crossband Repeater Operation

Turn this mobile rig into a mini-repeater.

by Bob Witmer W3RW

Many of us are fascinated by, and find very convenient to carry, the new, very concealable hand-helds. Trouble is, they, like any hand-held, have a limited range, and many areas still have sparse repeater activity. Very often, repeaters accessible from a mobile rig are not so from an HT.

What to do? Well, if you own the Kenwood TW-4100A dual band mobile rig, you can make your own crossband repeater! You can enjoy simplex-to-simplex, and simplex-to-repeater, operation in addition to dual-band mobile operation. All this in a package that doesn't cost an arm and a leg!

How? It's one of the better kept secrets in FM Hamdom today: The Kenwood 4100A, along with its advertised features, has built-in crossband repeat capability. It works by the receiver scanning back and forth between the two bands and initiating crossband transmit when it detects a signal. When the signal drops, it resumes scanning. (It has a built-in, three-minute transmit timer.)

Although Kenwood's sales brochure vaguely refers to this feature, the 4100A manual does not mention it. Close examination of the schematic does reveal some circuitry labeled "RP,"and a variable resistor, VR4, labeled "RPT," but none of the internal views indicate repeat mode components or circuitry.

I found out this capability was for real at a recent Hamfest where Paul, of Delaware Amateur Supply, mentioned that he had just received the 4100A repeat mode modification information from Kenwood and gave me a copy. However, the information in the "TW-4100 Repeater Operation Supplement", available to all from Kenwood, leaves out a few details. For example, it does not indicate that you need to adjust the repeat audio level (VR4), nor show where to make this adjustment.

The following describes what I have discovered about implementing and operating this mode.

"You can enjoy simplex-to-simplex, and simplex-to-repeater, operation in addition to dual-band mobile operation."

Hardware Mod of the 4100A

Modification requires the addition of one internal jumper between two posts. To do this, first remove the screws from the top and bottom covers of the rig. Take care when removing these covers, especially the bottom cover, as the speaker cable is attached to it. Then, just prepare a jumper wire about 3½" long, strip a small bit of insulation off the ends, and jump the two RP posts shown in Figure 3. That's it!

Well...Not Quite

Sometimes during repeater crossband operation, the TW-4100A may not detect a UHF signal while scanning between the two bands. This happens because the electric field generated by the strong UHF receiving signal cause the busy circuit to malfunction. Fortunately, there is a modification that will take care of this internal RF feedback problem. With less than $5 worth of components and a half-hour's worth of time, you can insure detection of the UHF signal. Best of all, this mod may be covered under warranty! (Get details on this from Kenwood.)

Refer to Figures 3 and 4. First, remove the covers as outlined above. Then, locate connector number 12 on the composite unit (RX-TX) on the bottom of the transceiver. Now, carefully strip ⅛" of insulation from the wire attached to pin 2 of connector 12, approximately ¼" from the connector. 6. Solder the three components, shown in Figure 4, between the wire and ground. A good ground location is the can around TC2 and L8. The mod is done—just carefully replace and resecure the two covers. Don't forget to adjust VR4.

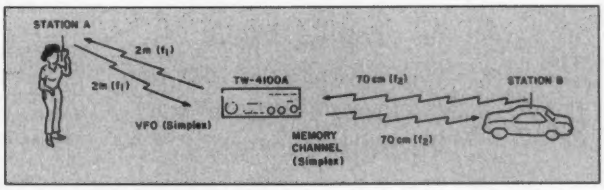


Figure 1. Simplex-to-simplex operation. In this mode, each band has the same frequency for both input and output.

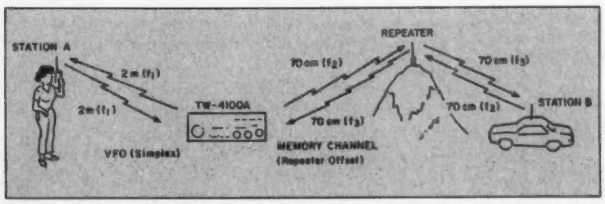


Figure 2. Simplex-to-repeater offset operation. In this mode, one band has the same input and output frequency, and the other band has differing input and output frequencies.

Key-Step Programming

The following shows the series of keystrokes and control

adjustments you need to make, after the hardware mods, to get the 4100A up and running as a crossband repeater.

1. Press the VFO/M.CH key to select the Memory Channel mode.

2. Select the desired Memory Channel after programming the Tone Frequency and the Offset frequency. Any channel may be used except odd, split memory channels 8 and 9.

3. Press the VFO/M.CH key to return to the VFO mode.

4. Select the desired operating frequency for the other band. For example, if the Memory Channel you selected contains a two meter frequency, then choose a 70 cm frequency in this step. (See Section 4-2-4 and the MHz key section on page 8 of the operator's manual.)

5. Adjust the SQL control to the threshold point for each band.

6. Select the DUP shift mode using the SEL key and the TUNING control. (Refer to section 4-2-5 in the manual.)

7. If you have the VFO frequency programmed as the one that will activate the remote repeater site, you should select the desired tone frequency and transmitter offset frequency at this time. (Refer to sections 4-2-6 through 4-2-8 in the operator's manual.) Note: For simplex-to-simplex operation set 0.0 MHz for the transmitter offset frequency.

8. Press the SHIFT key. (The DUP indicator will turn ON>.)

9. If you have the VFO programmed to activate the remote repeater and a subaudible tone is required for access, you should press the TONE key.

10. Turn the POWER switch OFF.

11. Press and hold the REV key and turn ON the POWER switch.

12. Release the REV key. A beep will sound and the radio will now operate as a crossband repeater. The receiver will alternate between the two bands continuously. If squelch opens on one band, the corresponding incoming signal will be automatically retransmitted on the other band.

Note: If the transmitter remains keyed for longer than three minutes, the transmitter will unkey, and the receiver will begin alternating between the two bands to search for an incoming signal. This protects the finals and functions as a built-in time-out timer.

13. To cancel repeater operation, turn the POWER switch OFF. When the radio is again switched ON, the radio will return to normal transceiver operation.

14. Adjust VR4, the repeat audio level pot, shown in Figure 3. IMPORTANT: This is not the VR4 shown on page 28 of the 4100A manual.

15. Set repeat audio level. The best setting I found was at approximately ¾ full clockwise rotation.

16. Disconnect the microphone when in this mode, otherwise the mike is "live," and, when the transmitter is activated, local audio mixes with the repeat audio. You can use this path to mix in CW ID audio.

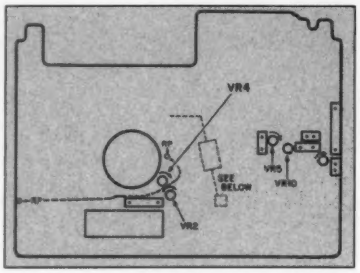


Figure 3. This shows both the repeater function mod and the mod to prevent RF feedback on UHF.

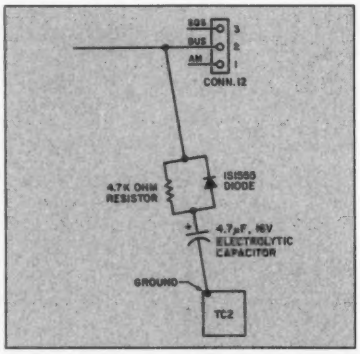


Figure 4. Schematic of the modification that ensures detection of the UHF signal.

Operating Considerations

The 4100A is not designed for continuous high power transmit operation. Consider the heat-dissipation environment of your rig's installation. The typical mobile installation on a hot summer day does not provide an ideal environment! If you are operating from a base power supply, be sure also to check its ratings.

"The 4100A is not designed for continuous high power transmit operation."

The three-minute timer actually runs closer to two minutes and 15 seconds. At the end of the time-out period, the transmitter is interrupted for a moment, and the receiver resumes scan mode. This initiates the transmit cycle again.

The tuning control, and all keys, including the PTT and UP/DWN switches of the microphone, do not function while the TW-4100A is operating as a repeater.

When the DCL System is operating, Code Squelch Operation is automatically activated, and the TW-4100A operates as a Digital Code Access Repeater. In other words, you can't access the repeater function unless you transmit the proper DCS code.

Typically, I use the two meter simplex to 440 MHz repeat mode, and I have adjusted the 440 (70 cm) low power level (VR5) to 20 watts, and the two meter setting to 2 watts. This minimizes power dissipation in the unit because of the 4100A's "Carrier-drop" mode, which tends to keep the transmitter keyed up for long periods due to the courtesy beep, time-out timer reset mode of most repeaters. See the 4100A manual, Figure 1, page 28, for the description and location of these adjustments.

During operation, keep in mind the scan style mode of the 4100A. Autopatch operation is a good example of this limitation. The typical result of initiating an autopatch call in this mode is the eventual time-out of the patch—once the patch is activated, it looks for signals from your transmitter. Unfortunately, the receiver of the 4100A still sees the repeater transmitter carrier, thereby preventing transmit operation.

Information is also now available on how to expand the UHF frequency range to 420 MHz, and the VHF range from 141 to 151 MHz. To do this, however, you first need to contact Kenwood. Also make sure to review these sections of Part 97 all which concern repeater operation, before operating the 4100A in repeater mode:

Section 97.65 Specifies excluded frequencies

Section 97.67(c) Specifies power output limitations

Section 97.85(e) Details control operator requirements

Section 97.86(d) Concerns Auxiliary operations.

Acknowledgement

Many thanks to Don W3LR for his patience and cooperation in allowing his 440 MHz repeater to be used to evaluate this modification. Thanks also to Kenwood for permission to reprint information from their "TW-4100 Repeater Operation Supplement" and Service Bulletin #926 (dated 12-17-87).

One further mention: The TW-4100A can be modified for MARS (Military Affiliated Radio System) and CAP (Civil Air Patrol) operation. This simple mod requires no component additions to the rig. For instructions on this mod, send to Kenwood a copy of your current amateur license and a copy of the documentation approving you for operations in these services.

The crossband mode of the Kenwood 4100A provides an operational capability that is typically unavailable in a package this compact and low-priced. 73

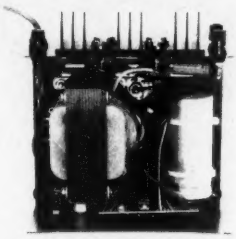
Parts Required for Anti-RF Feedback

(1) resistor 4.7k ohm, ¼ watt Part# RD14BB2B472J

(1) capacitor, electrolytic 4.7 μF, 16 V Part# CE04CW1C4R7M

(1) diode 1S1555 Part# V11-00-76-05

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277



INSIDE VIEW — RS-12A

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models **except RS-3A, RS-4A, RS-5A.**
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

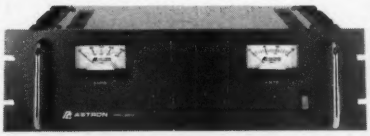
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM SERIES



MODEL RM-35M

19″ × 5¼ RACK MOUNT POWER SUPPLIES

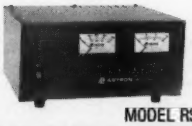
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4¾ × 5¾	4
RS-4A	3	4	3¾ × 6½ × 9	5
RS-5A	4	5	3½ × 6½ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

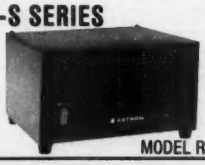
VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES



MODEL RS-12S

• Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7½ × 10¾	10
RS-10S	7.5	10	4 × 7½ × 10¾	12
RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

RADIO TELEGRAPH TERMINAL

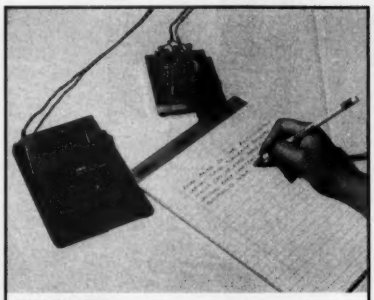
MORSE CODE DECODER ELECTRONIC KEYER MORSE CODE TRAINER

AR-501

Only—$229.00

DECODER

Input level	• 10mV to 2V RMS.
Input impedance	• 8 to 1kΩ—600Ω typical
Decoding speed	• 5 WPM to 30 WPM
Audio filter	• 800 Hz ± 80 Hz Active and PLL filters 700 Hz to 900 Hz internally adjustable.



TRAINER

Code generator	• Random code generator 5 characters/code group
Speed	• 5 WPM to 30 WPM 1 WPM increment

ELECTRONIC KEYER

Paddle input	• TTL level —LO/Actuating, HI/Stop Contact input —ON/Actuating, OFF/Stop
Key input	• TTL level —LO/Mark, HI/Space Contact input —ON/Mark, OFF/Space
Keying speed	• 5 WPM to 30 WPM 1 WPM increment
Keyer output	• Transistor switching, Open collector type

SPECIFICATIONS

Model	• AR-501 Radio telegraph terminal
Power source	• DC 12V to 13.8V—165mA
Size	• 4.5"-W x 2.24"-H x 6.25"-D
Weight	• 12.5 oz. (358 g)
Controls	• Power On/Off • Random code generator On/Off • Print-out On/Off • Monitor speaker level • Electronic keyer mode select • Speed Up & Down
Display Indicators	• LCD 32 characters—16 per line • Power On—Green LED • Tuning—Red LED
Front connections	• Paddle—Standard/Iambic • Ordinary telegraphic key • Headphone/Earphone
Rear connections	• DC 13.8V input • Audio input • External speaker • Keyer output • Printer output

PRINTER PORT

• Compatible with Centronics 8-bit parallel printer. At least 4K byte data buffer is required in a printer.

BACK TO BASICS — • — • But far more advanced — — • —

The AR-501, triple mode CW terminal in a small package, is a powerful gear to practice and play with. For the Novice, SWL and Amateur radio operators it detects Morse code between 5 to 30WPM. Just plug the AR-501 to your receiver to start translating the Morse code onto full 32 character LCD display. Very simple and easy to operate. You ask; for code practice?, both receive and transmit? Yes, the AR-501 does just that. It will improve your cord reception and keying technique at the speed you want. More?. it operates as an electronic keyer both standard and iambic. More Yet? How about a printer port? You bet, the AR-501 provides parallel printer port for hard copy. You can Log the QSO, and Practice. It will help you immeasureably. We even offer a standalone Nicad operated thermal printer as an option. **ACCESSORIES SUPPLIED:** The AR-501 Radio telegraph terminal comes complete with Receiver cable, DC Power cable, Miniature Phone plug, Miniature stereo phone plug, Spare fuse, Wall receptacle style power adaptor and Instruction manual. **ACCESSORIES AVAILABLE:** CC-501 Parallel printer cable — **$30.00**/DPU-411 Standalone Thermal printer with 8K buffer.—**$235.00**

ORDERING INFORMATION: For fastest service, call **800-523-6366** from 9 A.M. to 4 P.M. P.S.T. Send mail orders to: ACE Communications, Inc. 22511 Aspan Street, Lake Forest, CA 92630. VISA and MasterCard orders and certified or cashier's check or money order shipped within 48 hours of receipt. Rush service by UPS/Overnight, UPS/2nd Day Air and Federal Express is available at extra shipping charges. Purchase orders accepted from Government agencies. CA residents add 6% sales tax. **COD is $3.00 extra. WARRANTY INFORMATION:** The AR-501 covered by One Year Warranty. Extended warranty service available at the following rates: **3 Years—$25.00, 2 Years—$15.00. SATISFACTION GUARANTEE:** If, for any reason, the ORIGINAL PURCHASER, is not satisfied with the unit purchased, a full refund of the purchase price will be issued if the unit and all accessories are returned to us UNDAMAGED WITHIN 25 DAYS of the date of original purchase (Invoice date). This policy excludes any additional freight that may be incurred, and in no event modifies or limits the limited warranty.

ACE Communications

22511 Aspan Street • Lake Forest • California • 92630-6321 • (714) 581-4900 • Toll Free 1-800-523-6366

CIRCLE 279 ON READER SERVICE CARD

WE SHIP WORLDWIDE

Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

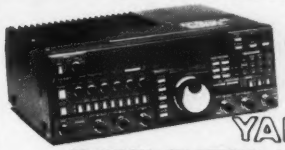
For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en Nueva York . . .

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday & Sunday 10 to 5 P.M.
Monday-Friday 9 to 6:30 PM Thurs. to 8 PM
Come to Barry's for the best buys in town.

Gobble Up Our Thanksgiving Savings

ICOM

IC-R71A, 751A, 781, 28A/H, 38A, 48A, Micro2/4, R-7000, IC-761, IC-375A, 275A/H, 3210A, 475A/H, 735, IC-900, IC-228H



ONV Safety belts-in stock

YAESU

FT-767GX, FT-757GXII, FT-311 RM, FRG-8800, FT-736, FRG-9600, FT-711RH, FT-2700RH, FT 212/712RH.

SMART PATCH

CES-Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone Great For Telephone Calls From Mobile To Base. Simple To Use. 510SA/510SAII

KENWOOD

TS440S/AT, R-5000, R-2000, TS-940 S/AT TM 221A/421A, TM-2570A/50A/30A, TR-751A, Kenwood Service Repair, TM-721A, TS-711/811A TM3530A, TH205AT, TH215A, TM-621A, TM-321A, TS140S, TS680S.

Antennas
A-S
Cushcraft
Hy-Gain
Hustler
KLM
METZ
Mini-Products
MULTIBAND
Mosley
MODUBLOX
TONNA

YAESU
FT-23/73/33/727R
FT-2/1/709R/H
FT-1903/1123
FTH-2005/7005

ICOM
IC2AT/12AT
ICO2AT-32AT
IC2/4GAT
IC-A2/U16

Landmobile HTs
ICOM: U16, H16, V100, U400
YAESU: FTH 2005/2007
UNIDEN, REGENCY, KING, TAD
MARINE ICOM: M5, M55, M700
AVIATION ICOM: A20 H.T.

PRIVATE PATCH IV, Duplex 8000

NYE MBV-A 3 Kilowatt Tuner

Budwig ANT. Products
MEL-TECH DVK-100 Digital Voice Keyer
FLUKE 77 Multimeter
Media Mentors—
Amateur Radio Course $99.95

RF Concepts

VoCom/Mirage/Alinco
Tokyo Hy-Power/TE SYSTEMS
Amplifiers &
5/8λ HT Gain
Antennas IN STOCK

ALINCO ALD 24T
DJ-100T
YAESU FTR-2410, Wilson
ICOM IC-RP 3010 (440 MHz)
ICOM IC-RP 1210 (1.2 GHz)
ICOM IC-RP 2210 (220 MHz)

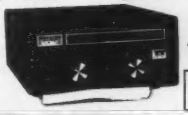
KANTRONICS
UTU, KAM, UTU-XT, KPC 2400, KPC IV, KAM

MFJ-989B

Soldering Station,
48 Watts, $68
MICROLOG-ART 1, Air Disk, SWL, Morse Coach

Computer Interfaces Stocked: MFJ-1270B MFJ-1274, MFJ-1224, AEA PK-88, MFJ-1278, PK-232 W/FAX.

MOTOROLA AUTHORIZED DEALER
KACHINA COMMUNICATIONS DEALER



Ten-Tec Tuner 229B

COMET ANTENNAS STOCKED

METRON MA-1000 B STOCKED

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
6146B

BIRD
Wattmeters &
Elements
In Stock

AEA 144 MHz
AEA 220 MHz
AEA 440 MHz
ANTENNAS

Complete Butternut Antenna Inventory In Stock!

DIGITAL FREQUENCY COUNTERS
Opto electronics model 1300H, 0-1300MHz
Trionyx, Model TR-1000, 0-600 MHz

Long-range Wireless Telephone for export in stock

BENCHER PADDLES. BALUNS. LOW PASS FILTERS IN STOCK

MIRAGE AMPLIFIERS
ASTRON POWER SUPPLIES
Saxton Wire & Cable, Int'l Wire

HEIL EQUIPMENT IN STOCK

SANGEAN Portable Shortwave Radios

Hy-Gain Towers & Antennas, and Rotors will be shipped direct to you FREE of shipping cost.

New TEN-TEC Corsair II, PARAGON

AMERITRON AUTHORIZED DEALER

MAIL ALL ORDERS TO: **BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST.)**

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"

BARRY INTERNATIONAL TELEX 12-7670
MERCHANDISE TAKEN ON CONSIGNMENT FOR TOP PRICES

Monday-Friday 9 A.M. to 6:30 P.M. Thursday to 8 P.M.
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)

AUTHORIZED DISTS. MCKAY DYMEK FOR SHORTWAVE ANTENNAS & RECEIVERS.

Subways: IRT/LEX-"Spring St. Station"
BMT-"Prince St. Station"
IND-"F" Train-Bwy. Station"

Bus: Broadway #6 to Spring St.
Path—9th St./6th Ave. Station.

Commercial Equipment Stocked: ICOM, MAXON, Midland, Standard, Wilson, Yaesu. We serve municipalities, businesses. Civil Defense, etc. Portables, mobiles, bases, repeaters . . .

Wanted: Full time Technicians

We Stock: AEA, ARRL, Alpha, Ameco, Antenna Specialists, Astatic, Astron, B & K, B & W, Bencher, Bird, Butternut, CDE, CES, Communications Spec., Connectors, Cushcraft, Daiwa, Digimax, Drake, Eimac, Heil Sound, Henry, Hustler (Newtronics), Hy-Gain, Icom, KLM, Kantronics, Larsen, MJF, J.W. Miller, Mirage, Newtronics, Nye Viking, Palomar, RF Products, Radio Amateur Callbook, Saxton, Shure, Telex, Tempo, Ten-Tec, Tokyo Hi Power, Trionyx TUBES, W2AU, Waber, Wilson, Yaesu Ham and Commercial Radios, Vocom, Vibroplex, Curtis, Tri-Ex, Wacom Duplexers, Repeaters, Phelps Dodge, Fanon Intercoms, Scanners, Crystals, Radio Publications, Uniden, Kenwood, Maxon, Metron, RFC, Amp Supply.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS

HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED

COMMERCIAL RADIOS stocked & serviced on premises.

Amateur Radio Courses Given On Our Premises, Call

Export Orders Shipped Immediately. TELEX 12-7670

ALL SALES FINAL

CIRCLE 41 ON READER SERVICE CARD

RAMSEY ELECTRONICS

RAMSEY

Quality Test Gear & Electronic Kits for Professionals and Hobbyists

COM-3

$2495.00 THE COMMUNICATIONS SERVICE MONITOR THAT WORKS HARDER FOR LESS.

Introducing COM-3...the new service monitor designed by service technicians for service technicians. It works harder for less...giving you advanced testing capabilities at a very affordable price. FEATURES • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10,000 μv output levels • High receive sensitivity, less than 5 μv • 100 KHz to 999.9995 MHz Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder, 1 KHz and external modulation

$49.95 wired includes AC adapter

PR-2 COUNTER PREAMP

The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for sniffing RF • ideal receiver/TV preamp • 3 db NF

PR-2 kit $36.95

$69.95 wired PS-2 kit $49.95

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiples Up in frequency • great for PL tone measurements • multiples by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

$89.95 wired includes AC adapter

PS-10B 1.5 GHz PRESCALER

Extends the range of your present counter to 1.5 GHz • 2 stage preamp • divide by 1000 circuitry • super sensitive (50 mV typical) • BNC connectors • 1.5 GHz in, 1.5 MHz out • drives any counter.

CT-70 7 DIGIT 525 MHz

$139.95 WIRED, INCLUDES AC ADAPTER

CT-90 9 DIGIT 600 MHz

$169.95 WIRED INCLUDES AC ADAPTER

CT-50 8 DIGIT 600 MHz

$189.95 WIRED INCLUDES AC ADAPTER

CT-125 9 DIGIT 1.2 GHz

$189.95 WIRED INCLUDES AC ADAPTER

FREQUENCY COUNTERS

Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one year warranty on parts and labor. We take great pride in being the largest manufacturer of low cost counters in the entire USA. Compare specifications. Our counters are full featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry and durable high quality epoxy glass, plated-thru PC Board construction. All units are 100% manufactured in the USA.

MODEL	FREQ RANGE	SENSITIVITY	ACCURACY	DIGITS	RESOLUTION	PRICE
CT-70	20 Hz-550 MHz	<50 mv To 150 MHz	1 PPM	7	1 Hz, 10Hz, 100Hz	139.95
CT-90	10 Hz-600 MHz	<10mv To 150 MHz <150mv To 600 MHz	1 PPM	9	0.1Hz, 10Hz, 100 Hz	169.95
CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	<25mv @ 50 MHz <15mv @ 500 MHz <100mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OV-1 OPTION	10 Hz-600 MHz	<10mv To 150 MHz <150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.90

ACCESSORIES FOR COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail for CT-70, 90 & 125	3.95
Nicad pack for CT-70, 90 & 125	8.95

MINI KITS—EASY TO ASSEMBLE—FUN TO USE

TONE DECODER
A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 **$5.95**

40 WATT 2 mtr PWR AMP
Simple Class C power amp features 8 times power gain 1 W in for 8 out, 2 W in for 15 out, 5 W in for 40 W out. Max output of 50 W, incredible value, complete with all parts, less case and T-R relay.
PA-1, 40 W pwr amp kit **$27.95**
TR-1, RF sensed T-R relay kit **6.95**

COLOR ORGAN
See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110VAC.
ML-1 Kit, **$8.95**

VOICE ACTIVATED SWITCH
Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED or even a tape recorder motor. Runs on 9 VDC.
VS-1 KIT **$6.95**

VIDEO MODULATOR
Converts any TV to video monitor. Super stable, tunable over ch 4-6. Runs on 5-15V accepts std. video signal. Best unit on the market! Complete kit, VD-1 **$7.95**

LED BLINKY KIT
Alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights. Runs on 3 to 15 volts.
BL-1 Kit, **$2.95**

MAD BLASTER
Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC
MB-1 Kit **$4.95**

UNIVERSAL TIMER
Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.
UT-5 Kit **$5.95**

WHISPER LIGHT
An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.
WL-1 Kit **$6.95**

FM WIRELESS MIKE
Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.
FM-1 Kit **$3.95**
FM-2 Kit **$4.95**

SIREN
Produces upward and downward wail. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.
Complete kit, SM-3 **$2.95**

SUPER SLEUTH
A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker.
SW-9 Kit **$5.95**

60 Hz TIME BASE
Runs on 5-15 VDC. Low current (25ma) 1 min/month accuracy
TB-6 Kit **$5.50**
TB-6 Assy. **$9.95**

TELEPHONE TRANSMITTER
Low cost with professional performance. Features include; self phone line powered, tunable from 76 to 108 MHz, polarity antisensitive, compact size (½" x 1¼"), easily installs anywhere on the phone line or inside the instrument itself.
PB-1 KIT **$14.95**

FM RECEIVER
For built-in applications or hobby experimentation. Full fledged superheterodyne receiver, microvolt sensitivity, 10.7 MHz IF, Integrated Circuit detector, 50 mw audio amplifier, 9V external power source, operation on standard FM broadcast band as well as large portions on each side, compact (6" square), for bug detection or reception
FR-1 KIT **$14.95**

FM MINI MIKE
A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.
FM-3 Kit **$14.95**
FM-3 Wired and Tested **19.95**

NEW

MICROWAVE INTRUSION ALARM
A real microwave doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz and is not affected by heat, light or vibrations. Drives up to 100 ma output, normally open or closed, runs on 12 VDC.
Complete Kit, MO-3 **$16.95**

NEW

SPEECH SCRAMBLER
Communicate in total privacy over your telephone or radio. This scrambler kit features full duplex operation using frequency inversion. Runs on a 9 volt battery. Both mike and line or speaker output/inputs. Easy to connect to any radio—telephone use requires no direct connection! Easy to build, uses IC DIGITAL circuitry. Can also be used to descramble most com. scramblers.
Complete kit, SS-7 **$29.95**
Case kit, CSS-7 **12.95**

ALL NEW KITS

Complete kit, SG-7 **$89.95** **PERSONAL SPEED RADAR**

New low cost microwave doppler radar kit "clocks" cars, planes, boats, horses, bikes, baseballs, models, runners or virtually anything that moves. Operates at 2.6 GHz with over 1/4 mile range. LED digital readout displays speeds in miles per hour, kilometers per hour or feet per second! Earphone output permits listening to actual doppler shift. Uses two 1 lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes deluxe ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

RADIOS

40 & 80 METERS HAM RECEIVERS

Sensitive all mode, AM, CW, SSB receivers for 3.5—4.0 or 70—7.5 MHz. Direct conversion design using NE602 IC as featured in QST and ARRL handbooks. Less than 1 μv sensitivity, varactor diode tuned, 50 mw audio output. Runs on 9VDC, has RF gain control. This kit is very easy to build, lots of fun and educational—ideal for the beginner or the old pro. The optional matching case kit features a rugged ABS plastic case with screened graphics. Included are machined aluminum knobs for a well-finished professional look.

40 Meter receiver kit, HR-4 **$24.95** 80 Meter receiver kit, HR-8 **$24.95** Receiver case kit, CHR **$12.95**

QRP TRANSMITTER KITS, 40 & 80 METERS

Operate a mini ham shack. These little CW rigs are ideal mates to our 40 and 80 meter receivers. Features include smooth variable tuning, one watt output and excellent keying characteristics. Runs on 12 VDC and is VSWR protected. See how far you can stretch your signal with one of these mini rigs. Optional ABS cases are available.

40 meters QRP rig, QRP-40 **$24.95** 80 meters QRP rig, QRP-80 **$24.95** Case kit, CQRP **$12.95**

AIRCRAFT RECEIVER KIT

Hear exciting aircraft communications—picks up planes up to 100 miles away. Receives 110—136 MHz AM air band, varactor tuned superhet design with AGC, ceramic filter and adjustable squelch. Runs on 9V battery, 50 mw audio output, 1 μv sensitivity. Optional matching ABS plastic case lets you take it anywhere, features screened graphics and machined aluminum knobs for a real professional look. Compact—great for airshows or for just plain hanging around the airport.

Complete kit, AR-1 **$24.95** Receiver case kit, CAR-1 **$12.95**

SHORTWAVE RECEIVER KIT

A fantastic receiver that captures the world with just a 12" antenna! Receives 4—11 MHz in 2 MHz bands, varactor tuned, superhet design with AGC, RF gain control, and 50 mw audio output. Uses new Signetics mixer chip for less than a microvolt sensitivity, runs on 9V battery. This is a fascinating scout, school or club project, and will provide hours of fun even to the most serious DX'er. Add the optional case kit and you have a real nice looking shortwave set.

Complete kit, SR-1 **$24.95** Receiver case kit, CSR-1 **$12.95**

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software, PC board, all necessary parts and full documentation.

Complete kit, PC-1 **$49.95**

FM COMMUNICATIONS/2 METER RECEIVER

Sensitive superhet FM receiver tunes any 5 MHz segment from 135—175 MHz. Listen to 2 mtr ham operations, high band police calls, weather or mobile phone calls! Easy to build receiver features varactor tuning, IC mixer stage, ceramic IF filters and dual conversion design with adjustable squelch. Less than 1 μv sensitivity, runs on 9 V battery, with 50 mw audio output. Optional ABS case with screened graphics and machined aluminum knobs provide a nice professional look.

Complete kit, FR-7 **$29.95** Receiver case kit, CFR-7 **$12.95**

NEW MINIKITS—NEW MINIKITS

BROADBAND PREAMP
A sensitive all purpose preamp, ideal for scanners, TV sets, VHF, UHF rigs, counters, etc. Features low noise, 4 db NF, 20 db gain, 100 KHz—1 GHz operation. Runs on 9—12 VDC, 50 ohms input.
Complete kit, SA-7 **$12.95**

LIGHT BEAM COMMUNICATORS
Transmits modulated infrared light up to 30 feet without lenses, up to 1/4 mile using lenses. Uses 30 KHz carrier for hum-free operation, transmits thru windows, etc. Ideal for "bugs" or listening to IR remote controls. Transmitter has sensitive mike input, receiver uses PIN detector and drives speaker output. Units operates on 9—12 VDC.
Transmitter kit, LB-6 **$8.95**
Receiver kit, LB-5 **$9.95**

HIGH POWER FM WIRELESS MIKE
A high power unit that will transmit up to 1/2 mile to any FM broadcast radio. Sensitive input accepts any type of mike, will pick up normal voices 10 feet away using the available mini-electric mike cartridge. Operates on 9—12 VDC
FM-4 kit **$9.95**
Sensitive microphone cartridge **$2.95**

MasterCard VISA

TERMS: • satisfaction guaranteed • examine for 10 days, if not pleased, return in original form for refund • add 6% for shipping and insurance to a maximum of $10.00 • foreign add 15% for surface mail • COD add $2.50 (COD in USA only) • orders under $15.00 add $1.50 • NY residents add 7% sales tax • 90 day parts warranty on all kits • 1 year parts & labor warranty on all wired units

CIRCLE 34 ON READER SERVICE CARD

PHONE ORDERS CALL 716-586-3950

RAMSEY ELECTRONICS, INC.
2575 Baird Rd.
Penfield, N.Y. 14526
TELEX 466735 RAMSEY CI
FAX 716-586-4754

Ultimate Repeater IDer

Choose from a library of repeater IDs in either CW or Voice.

by P.J. Ferrell K7PF

Every amateur transmitter must be routinely identified—including repeaters. A solid state CW generator issuing the ID in Morse code has been the most commonly used. ID tapes are also used—I recall one famous repeater in Central Washington which had an ID tape featuring a voice so seductive that visitors routinely tried to date the ID generator! And, recently, computerized repeater controllers use a speech synthesizer, a solid state device with high reliability.

Thus, any ID generator claiming to be ultimate now should be a solid-state unit that offers both CW and voice, and allows free selection of messages. Figure 1 is a block diagram of the new repeater that uses the ID generator described in this article.

Digital speech comes in many flavors, from near-perfect digital recorders to hard-to-understand phoneme synthesizers. High quality digital speech requires about 8000 8-bit samples per second (64 K-bit PCM). Thus, a 32 K-byte EPROM could hold about 4 seconds of speech of this quality. Data compression techniques, such as Adaptive Delta Modulation (ADM) and Linear Predictive Coding (LPC) have been applied to lower this storage requirement. National Semiconductor and Motorola make ADM chips offering high quality speech with up to an 8-fold reduction over PCM. Texas Instruments makes an LPC chip offering up to an 80 to 1 reduction over PCM (or 10 to 1 over ADM). The same 32 K-byte EPROM could hold up to 30 seconds of ADM speech or up to 5 minutes of LPC speech. The TI LPC Voice Synthesis Processor (VSP) can make both voice and CW sounds, and is the one most commonly found in computerized controllers for amateur repeaters. Efficient speech coding methods such as LPC require substantial signal processing prior to data storage, so that the vocabulary is normally limited to that provided by the chip maker. If this limitation can be overcome, then our "ultimate" identifier will use the TI VSP chip ("TMS5220C Voice Synthesis Processor Data Manual," Texas Instruments Incorporated, Copyright 1982).

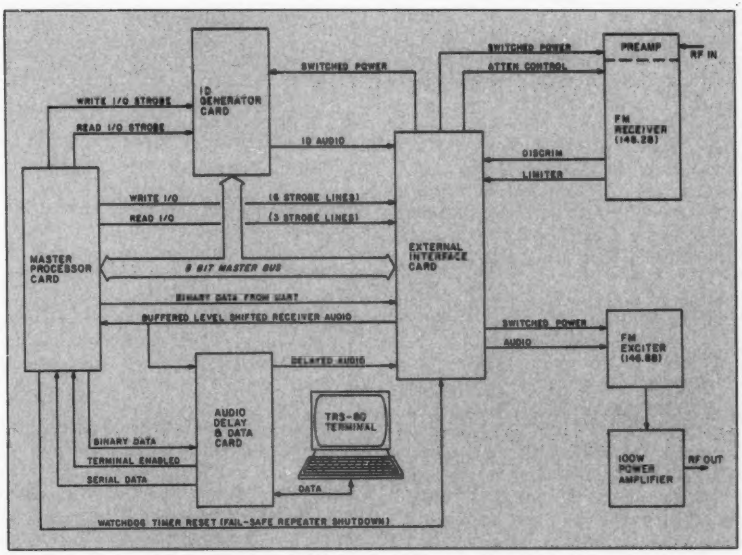


Figure 1. Repeater system block diagram.

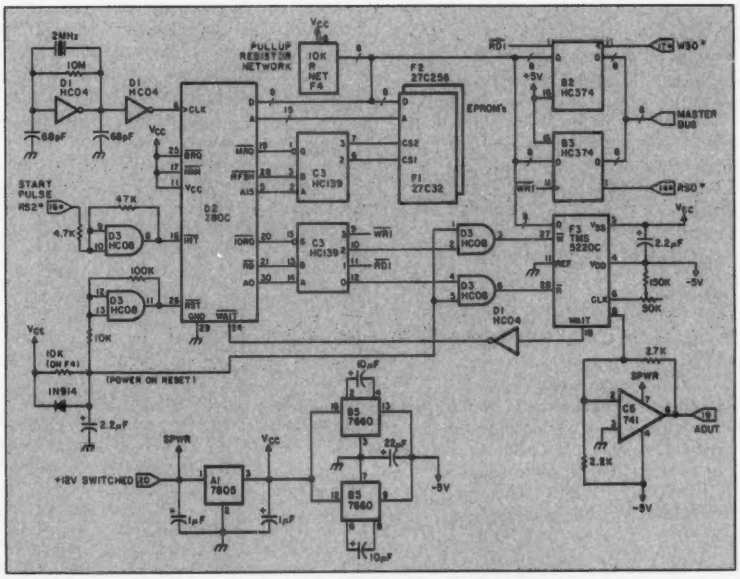


Figure 2. ID Processor schematic.

LPC Speech

The details of LPC processing are beyond the scope of this article, but the principle can be clearly understood. Human speech waveforms tend to be predictable (low entropy) signals. Given a series of samples of such a waveform, the next sample can be estimated quite accurately with past data. This calculation is performed at both transmitter and receiver. The transmitter sends only the ERROR, that is, the difference between the

actual and predicted sample values. The receiver simply adds the received ERROR to its own predicted value, giving the same sample value as that obtained by the transmitter. The better the prediction, the less data need be sent or stored. There is no approximation involved here, both transmitter and receiver get exactly the same series of samples (provided no transmission errors occur). This is a form of data compression coding known as "redundancy removal."

The TI TMS5220C VSP does its job by implementing a time varying tenth-order digital lattice filter which models a human vocal tract. This filter is excited by pitch (voiced sound) or by hiss (unvoiced sound). The output of this filter drives an 8-bit digital-to-analog (D/A) converter to produce the synthetic speech waveform. Compressed speech data is processed as frames, with a constant frame rate of about 40/sec. There are five frame types: Voiced (50 bits), Unvoiced (29 bits), Repeat (11 bits), Zero Energy (4 bits), and Stop (4 bits). Using only Voiced frames (50 x 40 = 2000 bits or 250 bytes per second), our 27256 EPROM holds over 2 minutes of sound. In practice, Repeat, Unvoiced, and Zero Energy frames reduce the required storage by over half. This gives us the aforementioned five minutes.

Hardware

The TMS5220C VSP interfaces neatly with a TMS6100 Vocabulary ROM (VROM) chip. Several VROMs can be paralleled for a more extensive vocabulary, and only the VROM word address need be supplied to speak the word. In addition to VROM speech, the VSP can "speak external"—speech data can be loaded from an external processor. Since our "ultimate" design uses complete messages rather than single words, externally supplied LPC data is taken from a 27C256 32K CMOS EPROM. Since the host repeater is battery powered, the ID generator is turned off when not needed, which is most of the time.

In addition to the TMS5220C VSP, a microprocessor is needed to fetch data and operate the identifier. I chose a CMOS Z-80, along with 74HC CMOS logic, for minimum power consumption. Figure 2 is the ID generator schematic diagram. A parallel interface to the repeater's master processor is used. A pair of 74HC374 tri-state latches between the repeater 8-bit Master Bus and the ID generator, form a parallel interface. The repeater's master processor issues commands and reads status using these latches, which must remain on to avoid loading the master bus during ID power down. The TMS5220C VSP is implemented in PMOS logic and requires both plus and minus 5 volts. A series pass regulator (7805) provides +5 V from the switched +12 V, and a small switching supply (dual 7660s) produces −5 V. Analog speech output from the VSP is amplified and level shifted to 0–5 V for repeater audio compatibility using a type 741 op amp. The processor program is stored in a 27C32 EPROM, and all messages are kept in the 27C256 EPROM. No RAM is used at all. In the unlikely event of needing more LPC data storage, you can substitute a second 27C256 for the 27C32.

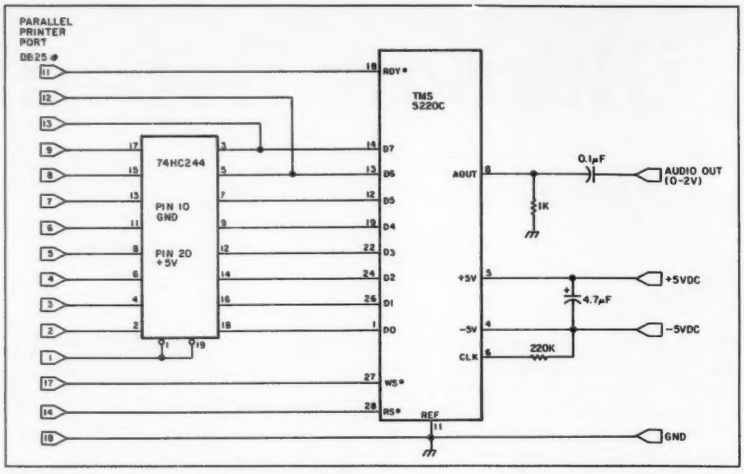


Figure 3. Speech Synthesizer development system.

Firmware

At power on, the power-on-reset signal momentarily lowers both READ and WRITE lines to the TMS5220C for an initial VSP reset. The Z-80 then begins, selecting interrupt mode (IM1) and setting the status latch to zero. A series of reset commands are sent to the VSP, status is set to 11H, and the processor halts with interrupts enabled. Upon receiving an interrupt pulse, execution begins at location 38H. A table of LPC data addresses and byte counts is referenced by the Z-80, and indexed using the requested message number. The table is located at the beginning of the 27C256, at Z-80 address 8000H. Each table entry consists of four bytes: the first two are the LPC data starting address, and the second two are the message byte count. A 2 MHz clock is assumed for the software timing loops. The following commented assembly language program listing covers the detailed operation of the Z-80C ID generator processor shown in Figure 2.

```
; * basic ID generator handler subroutine *
; turns ID power on, then latches in msg#
; if starts OK, exits leaving VSP running,
; else performs ID generator shutdown
;
STVSP:  PUSH    BC
        PUSH    AF                      ;save msg#
        LD      A,40H                   ;turn on..
        OUT     (EIDSC),A               ;..ID gen pwr
        POP     AF                      ;latch msg#..
        OUT     (IDGEN),A               ;..to ID proc
;
        LD      BC,500H                 ;loop count
SVSP1:  IN      A,(IDINT)               ;I/O pulse to the..
        DEC     C                       ;..ID processor
        JR      NZ,SVSP1                ;..interrupt line
        DJNZ    SVSP1
        OUT     (WDOG),A                ;reset rptr watchdog
;
        LD      BC,1000H
SVSP2:  IN      A,(IDGEN)               ;get status
        CP      33H                     ;VSP talking?
        JR      Z,SVSP3                 ;yes
        DEC     C
        JR      NZ,SVSP2                ;not yet..
        DJNZ    SVSP2                   ;..wait
;
        XOR     A                       ;ID proc..
        OUT     (IDGEN),A               ;..didn't start
        LD      A,0BFH                  ;shutdown..
        OUT     (EIDSC),A               ;..ID power
        JR      SVSP4
SVSP3:  XOR     A                       ;clr ID..
        OUT     (IDGEN),A               ;..latch
        LD      A,0C4H                  ;open ID audio..
        OUT     (EIDSC),A
SVSP4:  POP     BC
        RET
```

Table 1. This Basic ID generator handler subroutine illustrates use of the ID generator.

Master Processor Usage

To start an ID message, the repeater master processor powers up the ID generator and outputs a message number request. It then sends a set of interrupt pulses and waits a fixed amount of time for a "VSP is talking" status. Table 1 is an excerpt from the master processor's operational repeater program which illustrates use of the ID generator.

Speech Development System

If it were possible to "cut and paste" word sounds to make desired words, then virtually any message could be put together. Figure 3 is a schematic for the developmental system hardware which operates with the resulting frame editor. It uses a TMS5220C VSP and a single 74HC244 buffer chip, and plugs into any PC parallel printer adapter. An audio

Voice Synthesis Processor message # and sound			
0	no message (resting value)	20	zero
1	sea.rpt.pwr.on reset check complete	21	one
2	de k7pf /r (in morse)	22	two
3	k7pf repeater	23	three
4	de k7nxo /r (in morse)	24	four
5	k7nxo repeater	25	five
6	de w7mhy /r (in morse)	26	six
7	w7mhy repeater	27	seven
8	de k7lzj /r (in morse)	28	eight
9	k7lzj repeater	29	nine
A	de n7abe /r (in morse)	2A	ten
B	n7abe repeater	2B	eleven
C	seattle rptr.green mtn.(in morse)	2C	twelve
D	sea.rptr. green mtn.	2D	thirteen
E	from hi atop green mtn.	2E	fourteen
F	please identify	2F	fifteen
10	that's it!	30	sixteen
11	on emergency power	31	seventeen
12	data transmission	32	eighteen
13	time out	33	nineteen
14	sunday brunch	34	twenty
15	sunday pizza bash	35	thirty
16	complete	36	forty
17	repeater active	37	fifty
18	repeater inactive	38	bye . . .
19	data load	39	ready
1A	off frequency	3A	merry xmas
1B	the time is	3B	happy new year
1C	hours	3C	low deviation
1D	minutes		
1E	seconds		
1F	exactly		

Table 2. Partial message for the Seattle repeater shows the voice synthesis processor message # and sound.

amplifier to drive a speaker can be added, but the VSP audio output is of sufficient level to drive most headphones. The frame editor loads LPC code and permits deletions, additions, and changes to any parameter of any frame. The resulting code can be sent to the VSP for listening evaluation. When done, the LPC data can be written to disk as a file for later use as a sound, a word, a phrase, or a complete voice message. The LPC data can be laid out in PC memory, a message table constructed, and the whole thing burned into EPROM for use in the identifier. A partial message table for the Seattle Repeater is shown in Table 2.

Morse messages run longer than the voice version, and thus use many more frames. Only one Voiced (50 bit) frame is needed to set CW tone pitch; all other Morse frames are the short Repeat (11 bit) or Zero Energy (4 bit) frames. Curiously, the LPC data storage is about the same as that for the equivalent voice message. Synthesizer frame timing (40 frames/second) restricts achievable code speed to 36 WPM divided by an integer. We selected 18 WPM, as 36 WPM is too fast, and 12 WPM is too slow.

LPC Data Editing

LPC data is stored in bytes, but the VSP converts it to frames for generating sound. Any LPC data editor must deal with frames instead of bytes, so the editor converts stream-to-frames and frames-to-stream as required. The editor reads a disk file in bytes (stream) and stores it as frames. Frames may be added, deleted, or modified as needed. Other sounds (from other files) may also be added. At any time, the frames in work may be sent (converted back to stream) to the VSP for a listening evaluation. Two frames within the data can be designated (cursor and mark) to define a "block" of frames. The VSP sounding options are: start to end, start to cursor, cursor to end, and start to end, omitting the marked block.

For example, we needed the word "SEATTLE." The following sounds were used: the spoken "C," the word "at," and the word "all." The first cut sounded like "see at all," rather than the desired word. Accent is a matter of amplitude and duration, however, with easy control of these parameters using the editor. The final version of "SEATTLE" sounds as good as any word in the LPC vocabulary. Each finished word may be stored as a binary (stream) file on disk for later use in creaating an entire message. Both byte count and frame count are given by the editor. In order to greatly simplify control of the identifier, each message is stored in ROM completer and ready to speak.

Conclusion

Texas Instruments' LPC VSP product line is being upgraded, so TMS5220Cs may be in somewhat short supply. We recommend starting this project with the PC-based speech development system shown in Figure 3. If you can make the TMS5220C generate voice and CW messages to your liking, the rest is pretty standard stuff. The parallel interface can be easily modified, perhaps using a PIO/PIA, or even changed to a serial interface using a UART. The details will depend on access to the repeater control processor.

A copy of the LPC Frame Editor is available to radio amateurs on an IBM compatible DOS floppy disk. TI has graciously allowed us to include a selection of LPC encoded words, along with some phrases we have found useful, each a separate archived file. Documentation and test software is also included on the disk, which is intended for amateur radio use only. The disk is $27 postpaid. Contact *RadioRose Consortium, 6021 S. 119th St., Seattle WA 98178.*

```
                ; * * * * * * * * * * * * * * * * * * * * *
                ; *  ID Processor Operational Program     *
                ; *          K7PF - 02/01/87              *
                ; * * * * * * * * * * * * * * * * * * * * *
                ; - command from MPROC is desired msg #
                ; - status code back to MPROC is:
                ;       00 - at power on
                ;       11 - reset & init complete
                ;       22 - no such message
                ;       33 - VSP is talking
                ;       55 - normal completion code
                ;       FF - immediately after interrupt
                ; note: MPROC ** MUST ** clear ID cmd latch
                ;       prior to generator power down!
                ;
                ;   EQUATES:
                ;
0000            TMS     EQU     00H         ;TMS5220 R/W
0001            LATCH   EQU     1H          ;I & O LATCHES
8000            TABLE   EQU     8000H       ;32K
                ;
0000                    ORG     0H
                ;
0000 ED56       START:  IM1                 ;intrpt mode 1
0002 3E00               LD      A,00H       ;pwr on..
0004 D301               OUT     (LATCH),A   ;..val
0006 3E70               LD      A,70H       ;reset VSP..
0008 0E10               LD      C,10H       ;..16 times
000A D300       RSVSP:  OUT     (TMS),A
000C 0632               LD      B,32H       ;Twait =..
000E 10FE               DJNZ    $           ;..300 uS
0010 0D                 DEC     C
0011 20F7               JR      NZ,RSVSP
0013 3E11               LD      A,11H       ;init done..
0015 D301               OUT     (LATCH),A   ;..val
0017 FB                 EI
0018 76                 HALT
                ;
                ; IDROM program signature:
                ;
0020 4B375046           DB      'K7PF - 02/01/87 '
                ;
                ; code executed following interrupt (mode 1)
                ;
0038                    ORG     38H         ;INTRPT
                ;
                ; note that reading LATCH also writes an FF to output
                ;
0038 DB01               IN      A,(LATCH)   ;write FF & get msg#
003A 010080             LD      BC,TABLE    ;table base
003D 6F                 LD      L,A         ;msg# in..
003E 2600               LD      H,0         ;..HL
0040 29                 ADD     HL,HL       ;*2
0041 29                 ADD     HL,HL       ;*4
0042 09                 ADD     HL,BC       ;add table base
0043 4E                 LD      C,(HL)      ;load BC..
0044 23                 INC     HL          ;..with LPC
0045 46                 LD      B,(HL)      ;..data offset
0046 23                 INC     HL
0047 5E                 LD      E,(HL)      ;load DE..
0048 23                 INC     HL          ;..with LPC
0049 56                 LD      D,(HL)      ;..bytecount
004A 78                 LD      A,B
004B A1                 AND     C
004C 3C                 INC     A           ;BC = FFFF ?
004D 3E22               LD      A,22H       ;load 'not found'..
004F CAB200             JP      Z,EXIT      ;..code & exit
0052 C38000             JP      RUN         ;else proceed
                ;
                ; ID code resumes here:
                ;
0080                    ORG     80H
                ;
0080 210080     RUN:    LD      HL,TABLE    ;pointer to LPC..
0083 09                 ADD     HL,BC       ;..data in HL
0084 3E60               LD      A,60H       ;speak external..
0086 D300               OUT     (TMS),A     ;..command to VSP
0088 0600               LD      B,0
008A 10FE               DJNZ    $           ;dly 1.5 mS for VSP
008C 3E33               LD      A,33H       ;notify mproc..
008E D301               OUT     (LATCH),A   ;..we're running
                ;
0090 7E         TALK:   LD      A,(HL)      ;LPC data..
0091 23                 INC     HL          ;..sent to
0092 D300               OUT     (TMS),A     ;..VSP
0094 10FE               DJNZ    $           ;13.5 mS delay
0096 DB88       WBUF:   IN      A,(TMS)     ;get VSP status
0098 00                 NOP                 ;allow at least..
0099 00                 NOP                 ;..12 uS Twait
009A E640               AND     40H         ;BL (buffer low)?
009C 28F8               JR      Z,WBUF      ;no, wait
009E 1B                 DEC     DE
009F 7A                 LD      A,D         ;done?
00A0 B3                 OR      E
00A1 20ED               JR      NZ,TALK     ;no, send next
00A3 AF                 XOR     A           ;yes, send..
00A4 D300               OUT     (TMS),A     ;..final null
00A6 10FE               DJNZ    $
                ;
00A8 DB88       WTLK:   IN      A,(TMS)     ;get VSP status
00AA 00                 NOP                 ;insure TMS5220..
00AB 00                 NOP                 ;..Twait time
00AC E680               AND     80H         ;TS (talk status) ?
00AE 20F8               JR      NZ,WTLK     ;yes, wait
                ;
00B0 3E55               LD      A,55H       ;normal completion..
00B2 D301       EXIT:   OUT     (LATCH),A   ;..output code
00B4 FB                 EI                  ;just in case
00B5 76                 HALT
0000                    END
```

Table 3. K7PF's ID Processor Operational Program.

FREE CATALOG
TEST INSTRUMENTS & HARD-TO-FIND TOOLS

Packed with over 5,000 quality products for testing, repairing, and assembling electronic equipment. A full selection of test instruments, power protection equipment, precision hand tools, tool kits, soldering supplies, and much more. Products are shown in full color with detailed descriptions and pricing. All products come with a 100% satisfaction guarantee. SAME-DAY shipment program.

In a hurry to receive your catalog?
Call **(800) 225-5370**
In Massachusetts call (508) 682-2000

Contact East, Inc., Dept. R425
P.O. Box 786, No. Andover, MA 01845

CIRCLE 334 ON READER SERVICE CARD

CIE Cleveland Institute of Electronics
Accredited Member National Home Study Council

CIE is the world's largest independent study electronics school. We offer ten courses covering basic electronics to advanced digital and microprocessor technology. An Associate in Applied Science in Electronics Engineering Technology is also offered.

Study at home — no classes. Programs accredited and eligible for VA benefits.

CIE Cleveland Institute of Electronics
1776 East 17th St., Cleveland, Ohio 44114

YES! I want to get started. Send me my CIE school catalog including details about the Associate Degree program.

Print Name _____
Address _____ Apt. _____
City _____ State _____ Zip _____
Age _____ Area Code/Phone No. _____
Check box for G.I. Bulletin on Educational Benefits
☐ Veteran ☐ Active Duty MAIL TODAY!

AAR95

CIRCLE 157 ON READER SERVICE CARD

Soft-Control Power!

Software to

- Manage your radio's memory channels from a PC
- Control your radio's functions from the PC's keyboard
- User friendly operation

Available NOW for Kenwood TS-440S, TS-940S and IBM PC, AT, or compatible. Inquire for other radio/PC combinations.

ONLY **$59.95**

Rad-Com
P.O. Box 1166
Pleasanton, CA 94566
(415) 462-4609

CIRCLE 356 ON READER SERVICE CARD

Discover CAROLINA WINDOM

80–10M
Use transmatch
132' overall
Matching XFMR
Line Isolator
Vert Radiator
Coax fed
Assembled
$69.95

High performance
Proven Results
$70 Beam?

The RADIO WORKS

Your Passport To a world Of new ideas And exceptional HF wire antennas

Rugged new baluns
Full range of HF, VHF mobile antennas, ducks, wire, coax, parts, line, accessories.

SEE WHAT WE'RE DOING NOW!
Contact Jim, W4THU—free discount catalog
Send $1 for catalog by 1st Class mail.
Box 6159, Portsmouth, VA 23703
(Dealer Inquiries Welcome)

804-484-0140

CAROLINA WINDOM
SEE THE REVIEW IN JUNE '88 WORLD RADIO MAGAZINE.
Enthusiastic users say it's the best wire antenna. Outperforms wire antennas previously used. Knock-you-socks-off performance on 80-10. A $70 beam?

If you hear one, you'll want one.
Made with pride by the RADIO WORKS in VA/USA

CIRCLE 150 ON READER SERVICE CARD

THE ORIGINAL DIGITAL VOICE KEYER™

"The choice of contesters worldwide."

Suggested Amateur Net Price **$260.**

DVK-100

Now for the first time you can enjoy the truly unique operation of a Digital Voice Announcement System, designed specifically for Amateur Radio communications. The DVK-100 represents the latest technology in digital audio processing.

Create your own natural voice contest calls, CQ's etc. Your voice is stored in digital memory, ready to be played back at the touch of a key. The Digital Voice Keyer is not a tape recorder or robotic sounding synthesizer but a true full fidelity natural voice record/playback system.

The DVK-100, is a must for the avid contester and great audio accessory for any Ham Shack.

FEATURES

- •Superior natural voice quality
- •Microprocessor controlled
- •32 seconds of message time
- •PTT/VOX operation
- •Dynamic/condensor mike input
- •Selectable monitor amplifier
- •Positive/negative PTT keying
- •Selectable message repeat
- •Selectable audio compressor
- •Selectable end of transmission tone generator
- •Sealed membrane keyboard
- •4 independent voice memories
- •Remote keyboard connector

The sound of the future is here today. Contact your local Amateur radio dealer or NTL for further information.

Digital Voice Keyer™ is a trademark of Nel-Tech Labs.

NEL-TECH LABS INC. P.O. Box 1030
Londonderry, NH 03053 (603) 434-8234

CIRCLE 130 ON READER SERVICE CARD

SPECIALISTS IN FAST TURN P.C. BOARDS

PROTO TYPE P.C. BOARDS
AS LOW AS $25.00

- SINGLE & DOUBLE SIDED
- PLATE THROUGH HOLES
- TEFLON AVAILABLE
- P.C. DESIGN SERVICES

FOR MORE INFORMATION

Midland Technologies

34374 EAST FRONTAGE ROAD
BOZEMAN, MT 59715 (406) 586-1190

CIRCLE 252 ON READER SERVICE CARD

5-1000 MHz PREAMPLIFIERS

	NF	G	P(1dB)	$
WLA21M	3dB	13dB	8dBm	57
WLA22M	4	11	12	61
WLA23M	4	22	12	87
WLA24M	3	20	18	109

430/50 MHz CONVERTER

RXC431	.15uV	20dB	99

WILAM TECHNOLOGY, Div. of
WI-COMM ELECTRONICS INC.
P.O. Box 5174, MASSENA, N.Y. 13662
(315) 769-8334

CIRCLE 319 ON READER SERVICE CARD

THE RF CONNECTION

"SPECIALIST IN RF CONNECTORS AND COAX"

Part No.	Description	Price
PL-259/USA	UHF Male Phenolic, USA made	$ .60
83-1SP-1050	PL-259 Phenolic, Amphenol	.85
83-822	PL-259 Teflon, Amphenol	1.50
PL-259/ST	UHF Male Silver Teflon, USA	1.50
UG-175	Reducer for RG-58	.20
UG-176	Reducer for RG-59 & MINI 8	.20
UG-21D/U	N Male RG-8, 213, 214, Amphenol	2.95
UG-21B/U	N Male RG-8, 213, 214, Kings	4.00
9913/PIN	N Male Pin for 9913, 9086, 8214 fits UG-21D/U & UG-21B/U N's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	3.95
UG-21B/9913	N Male for RG-8 with 9913 Pin	4.75
UG-146/U	N Male to SO-239, Teflon USA	5.00
UG-83/U	N Female to PL-259, Teflon USA	5.00

"THIS LIST REPRESENTS ONLY A FRACTION OF OUR HUGE INVENTORY"

THE R.F. CONNECTION
213 North Frederick Ave. #11
Gaithersburg, MD 20877
(301) 840-5477

PRICES DO NOT INCLUDE SHIPPING
PRICES SUBJECT TO CHANGE
VISA, MASTERCARD, ADD 4%
UPS C.O.D. ADD $2.25 PER ORDER

CIRCLE 115 ON READER SERVICE CARD

MISSION CONSULTING, INC.
MISSION COMMUNICATIONS
11903 Alief-Clodine Suite 500
HOUSTON, TEXAS 77082

ICOM

WE HAVE EXPANDED AND NOW STOCK MANY NEW PRODUCTS. WE CARRY:
AEA, ALINCO, AMECO, AMP SUPPLY, APHA DELTA, ANTECO, APRIL, B&B INSTRUMENTS, BARKER & WILLIAMSON, BENCHER, BOMAR, BUTTERNUT, BEE, CUSHCRAFT, COMMUNICATION SPECIALISTS, CRB RESEARCH, DAIWA, DIAMOND, HENRY, HUSTLER, HAM RADIO, INTL. CRYSTAL, INTL. WIRING & CABLE, KANTRONICS, KACHINA, KENPRO, KDK, KLM/MIRAGE, LUNAR, LARSON, MOBILE MARK, MFJ, NEUTECH, NCG, NYE, PERIPHEX, QST, RF INDUSTRIES, RADIO PUBLICATIONS, RADIO AM. CALLBOOK, SAMSON, SPI-RO, SMILEY ANTENNA, SANTEC, SYN. TEXTILES, 73MAG, STANDARD, TAD, TEN-TEC, VALOR, VECTOR, GORDON WEST, WELZ, YAESU, AND ICOM.

In house service available. Just write, or give us a call! (713) 879-7764 Telex 166872 MCON UT

CIRCLE 187 ON READER SERVICE CARD

RC-1000 REPEATER CONTROLLER

From Micro Computer Concepts

- Complete RX-TX-Phone Line Interface
- Repeater Control
- Autopatch
- CW ID
- Tailbeeps
- Remote Base/Tape
- 12 V AC/DC Oper.
- Reverse Patch
- DTMF Decoder
- Pulse/Tone Dialing
- 90 Day Warranty

Wired & Tested w/manual ...$219.95

Distributed by:
R & L Electronics
575 Main St. / Hamilton, OH 45013
1-800-221-7735
in Ohio 513-868-6399

MasterCard VISA

CIRCLE 348 ON READER SERVICE CARD

CONTACT YOUR DEALER
FOR MORE INFORMATION
Amateur Radio Baluns-
Traps-Remote Coaxial Switches
NOW MFG. JAMES MILLEN ELECTRONIC EQUIPMENT
UNADILLA DIV. of ANTENNA'S ETC.
P.O. BOX 215BV ANDOVER, MA 01810
508-475-7831

CIRCLE 136 ON READER SERVICE CARD

Computerized Tuning for TS-830S

Control digital VFOs with your personal computer.

by Robert Fisher KF6DF

Pushbutton tuning has been around for some time—you now find this capability even on microphones! My Kenwood TS-830S is a rig with such capabilities—it has a digital VFO called the DFC-230 Frequency Controller. Two buttons on the top of the microphone control this VFO. Although I used my Kenwood TS-830S, this system works with any rig that uses scanning switches on the microphone.

I developed a scanning system that uses simple computer operations. It is a software program that generates tones to send to two tone decoder ICs. Each decoder controls the scanning of the band. An optical coupler takes the place of each microphone switch used for frequency scan. See Figure 1.

The Computer Hook-Up

I used the TRS-80C Color Computer to generate the audio for the PLL tone decoder chips. Any computer that generates audio through software programming, however, will work. Use the audio output either from the monitor's earphone jack, or from the audio input to the RF module in the computer itself. A shielded cable connects to the input of the 567 PLL ICs.

The Computer Program

Most computers can use a simple BASIC loop program for this system. A tone that activates one PLL is used for up scanning, and another tone is used for down scanning. BASIC commands preselect the tone frequencies. Each loop cycle generates a tone pulse. When using the frequency controller, a pulse changes the frequency by 20 Hz. Thus, five pulses change the frequency by 100 Hz, the smallest frequency unit displayed on most rigs.

Leaving the tone on for more than a few seconds switches the unit to fast scan, allowing rapid frequency change. The user can select 20, 100, and 1000 Hz steps, and fast scan. (See Figure 5.) In BASIC, the INKEY$ function scans the keyboard for the selected keys, and branches off to the loop that selects the scanning increments. Additional loops change tone frequency for minor variations or drift in the PLL locking frequency. Thus, if the PLLs were first set to 1000 and 2000 Hz, and drift, tapping the up or down arrow slightly shifts the high tone. Hold down the Shift key for the low tone adjustment.

Controller Hook-Up

The PLLs drive optical couplers. (See Figure 2.) These couplers are made from an infrared LED and a photo transistor held together with shrink tubing. Two of these units are needed. The cable is soldered to the 8-pin connector plug used for the DFC-230 Frequency Controller. See Figures 1 and 3.

Using the Computer

I found this method of computer-controlled scanning easy to use and adaptable to other computers. This is because only tones control the scanning system. You can also use a variety of rigs—with no modifications needed—with this system. Just buy the proper plug seen on the end of the microphone cord. The user can wire the microphone plug in parallel and scan the band manually, as well as by

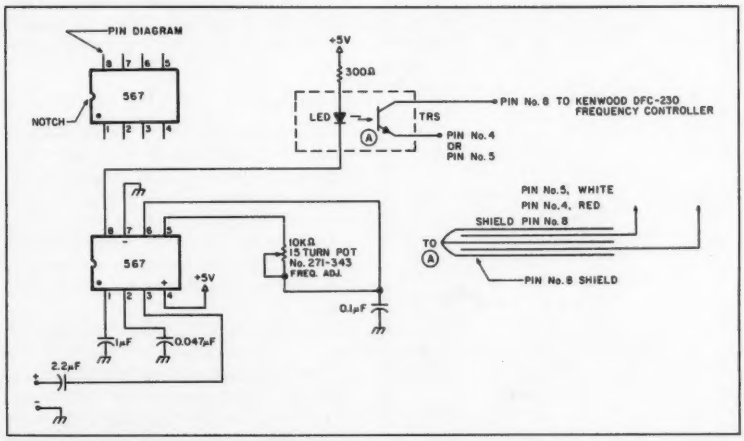


Figure 1. Schematic for computer/TS-830S transceiver interface. Circuit can be modified for use with other transceivers.

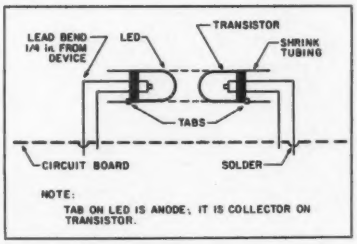


Figure 2. LED and optical detector mounting and orientation.

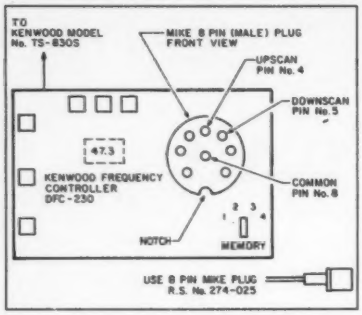


Figure 3. Details of pin signals from Kenwood DFC-230 frequency controller.

computer. By wiring a stand-up microphone into the plug, the operator can use computer control of scanning while he talks. He can fine-tune his signal in 20 Hz increments with Receive Incremental Tuning (RIT) while holding the transmit frequency constant. This fine-tuning procedure works well on RTTY, AMTOR, packet, and SSB.

"SPACE BAR" tunes in 100 Hz steps. The "@" key performs 1 kHz frequency changes. The "F" key selects fast scan when going from the AMTOR or RTTY, to packet subbands.

VFO Tuning Interface Parts List

Quantity	Item	RS Part #
2	567 PLL ICs	276-1721
1	Circuit board	276-168
1	Mike plug, 8-pin	274-025
1	Optical diode, detector pair	276-142
2	10kΩ 15-turn mini pot	271-343 or
2	10kΩ 270° pot	271-218 or
2	5kΩ 270° pot	271-217
2	2.2 µF (25 VDC) capacitor	
1	0.1µF disk capacitor	
1	0.047µF disk capacitor	
1	1µF (10 VDC) capacitor	
2	1" long, ½" dia. heat shrink tubing	

Table 1.

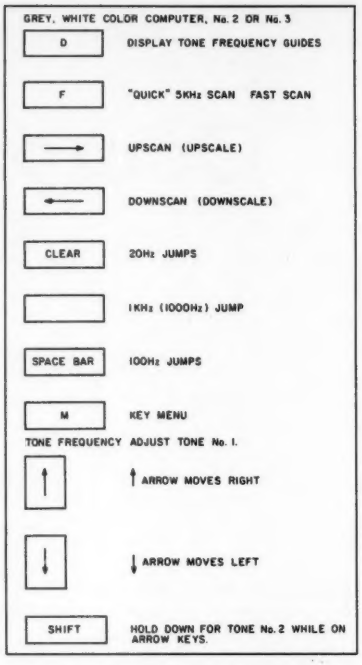


Figure 5. Keyboard function reference guide.

```
10 REM-TUNING PROGRAM
20 FU=236:REM-HIGH TONE,UPSCAN
30 FD=233:REM-LOW TONE,DOWNSCAN
40 M=1:N=1
50 CLS:PRINT"PRESET TUNING:":PRINT
60 GOTO 330
70 REM-KEYBOARD SELECT FUNCTIONS
80 A$=INKEY$
90 IF A$="M" THEN GOSUB 470
100 IF A$=CHR$(12) THEN M=1:N=1:CLS:PRINT"20 HZ STEPS"
110 IF A$=CHR$(32) THEN M=1:N=5:CLS:PRINT"100 HZ STEPS"
120 IF A$=CHR$(9) THEN 240
130 IF A$=CHR$(8) THEN 280
140 IF A$=CHR$(64) THEN M=25:N=1:CLS:PRINT" FAST TUNE 1KC STEPS"
150 IF A$="F" THEN M=82:N=1:CLS:PRINT"FAST TUNE 5KC STEPS"
160 IF A$=CHR$(95) THEN FD=FD+1:CLS:GOTO 330
170 IF A$=CHR$(91) THEN FD=FD-1:CLS:GOTO 330
180 IF A$=CHR$(64) THEN N=50:CLS:PRINT"1 KC STEPS":M=1
190 IF A$=CHR$(10) THEN FU=FU-1:CLS:GOTO 330
200 IF A$=CHR$(94) THEN FU=FU+1:CLS:GOTO 330
210 IF A$="D" THEN CLS:GOTO 330
220 GOTO 80
230 REM-TONE GENERATOR LOOPS-M IS THE LENGTH OF THE TONE AND N IS THE NUMBER OF
REPEATS.
240 FOR I= 1 TO N
250 SOUND FU,M
260 NEXT I
270 GOTO 80
280 FOR I= 1 TO N
290 SOUND FD,M
300 NEXT I
310 GOTO 80
320 REM-TUNING GRAPHS
330 PRINT:PRINT"TONE FREQUENCY ADJUST":PRINT
340 FOR I=FD-3 TO 240
350 IF I=FU THEN PRINT CHR$(94);
360 PRINT CHR$(42);
370 NEXT I
380 PRINT "UPSCAN"
390 PRINT:PRINT
400 FOR I=226 TO FU+3
410 IF I=FD THEN PRINT CHR$(94);
420 PRINT CHR$(42);
430 NEXT I
440 PRINT"DOWNSCAN":PRINT:PRINT"UP OR DOWN ARROW-HIGH TONE      SHIFT/UP OR DOWN
 ARROW-LOW TONE"
450 GOTO 80
460 REM-MENU PRINT SUBROUTINE
470 CLS:PRINT@75,"KEY MENU"
480 PRINT@128,"D-DISPLAY TONE FREQUENCY SCALE"
490 PRINT@160,"F-FAST 5KC SCAN"
500 PRINT@192,"@-1 KC JUMP"
510 PRINT@224,"SPACE BAR-100 HZ JUMPS"
520 PRINT@256,"RIGHT ARROW-UPSCAN"
530 PRINT@256,"CLEAR-20HZ JUMPS"
540 PRINT@320,"LEFT ARROW-DOWNSCAN"
550 PRINT@352,"RIGHT ARROW-UPSCAN"
560 PRINT@416,"UP ARROW-HIGH TONE,INCREASE"
570 PRINT@448,"DOWN ARROW-HIGH TONE,DECREASE"
580 PRINT@480,"SHIFT/ARROW-DITTO FOR LOW TONE"
590 RETURN
600 END
```

Figure 4. BASIC tuning program for CoCo. Any computer that can generate audio tones can be used as a controller.

The Circuit

The builder can wire the circuit on a pre-drilled circuit board, as shown in the parts list. It uses two 567 PLL tone decoders. Each one switches on the infrared LED. This turns on the photo transistor, which lowers resistance across the pins shown to start the scanning process. Each 567 PLL is adjusted to the frequency selected for up or down scanning. Pin #8 pulls low when the program selects the proper tone. You can select any tones between 1 and 2 kHz. They can be as narrowly spaced apart as 200 Hz. See Figure 1.

The power supply is a simple 5-volt regulated supply. I used a plug-in transformer with a rectified DC used for portable calculators. A three-pin regulator provides 5 volts.

Conclusion

I found this system very simple and easy to use. I did not have to make any modifications to the rig or the frequency controller. All you need to do is trace the wires from the microphone scanning switches to the pins on the microphone plug. The photo switching transistor should be sufficient to jump the switches. If not, use a reed relay instead.

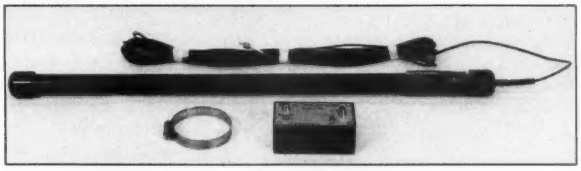
So, enjoy building this simple system! It's a nice one-evening project, and who can resist having another neat gimmick to show off in the shack? More importantly, this project should help take away some of the mysticism and fear you may have about interfacing microcomputers with ham gear. 73

73 Review *by Larry R. Antonuk WB9RRT*

LF Engineering L-101S Receiving System

Fast and easy way to receive on the 1750m band!

LF Engineering Company, Inc.
17 Jeffry Road
East Haven, CT 06512
Price: $120



The LF Engineering L-101S 1750m receiving system.

Ham radio operators, by their very nature, like to explore. "Tuning around" and becoming familiar with a new band is one of the more pleasurable aspects of amateur radio. The lack of activity on some of the less common bands is mainly due to one problem—the difficulty of obtaining the necessary equipment. The necessary investment of time and/or money is often too great to justify. While you can often either borrow or build equipment for new bands, either solution has its drawbacks. Finding commercial hardware becomes more and more of a problem the further away from 80–10 meters you want to operate.

The 1750 meter VLF band is one such obstacle. Also known as the Experimenter's Band, it is, by definition, the domain of the home-brewer. "1750 meter appliance operator" is the original oxymoron!

What to do to just "tune around" on 1750 meters? What if you've been introduced to 1750 meters, and want to get active, but just don't have time to wind all those coils? What if all this talk of ground resistance, top hats, and Litz wire is just too overwhelming for the time being?

LF Engineering Company, Inc., has a simple solution to these problems. The L-101S Receiving System is a combination of active antenna and receiving converter. Used in conjunction with a 3.5 to 4.0 MHz receiver, the system provides coverage from 3 to 530 kHz with no antenna tuning required.

The heart of the L-101S Receiving System is the new L-400B Active Antenna. Housed in a 26" x 1" sealed PVC probe, the antenna comes with a 50-foot RG-174/U cable. The L-400B represents a breakthrough in LF antenna technology—a field sensitivity 20 dB greater than the original L-400, with equal or greater broadcast intermodulation rejection. These figures are possible due to a proprietary design 18 dB amplifier and a lumped-constant low-pass filter, both the result of several months of research and development. The dynamic range of the L-400B is 110 dB, and it can operate in the linear region with signal levels of up to 200,000 microvolts. Extended RF and ESD protection is included.

The L-101B VLF Converter makes up the rest of the receiving system. The converter comes housed in a 4" x 2" x 1.5" box, and uses RCA-style connectors. The unit covers 2 to 500 kHz with no returning, and produces either 3.5 to 4.0, or 4.0 to 4.5 MHz outputs. Powered by a standard nine volt battery, the unit will operate for one year before replacement is necessary. The L-101B was designed with a JFET mixer to provide a higher than normal input impedance, resulting in higher gain and wider dynamic range, without compromising intermod rejection.

Using the receiving system couldn't be easier. The antenna is easily clamped to almost any existing structure. The RG-174/U cable is thin enough to be easily concealed. Antenna cable is included, but the converter to radio cable is not. In most cases, this will be a male RCA to PL-259 jumper. Once you're connected, the system is operational. Simply tune across the 80 meter band to hear a variety of operators, beacons, and airports.

Or, in my case, light dimmers, electric fans, and thunderstorms! I guess this means I'll have to be patient enough for winter to come—but at least I'll have enough time to get my VLF transmitter on the air!

RF POWER TRANSISTORS

We stock a full line of Motorola & Toshiba parts for amateur, marine, and business radio servicing

SEE YOU AT THE MIAMI HAMFEST

Partial Listing of Popular Transistors in Stock

P/N	Net/Ea	P/N	Net/Ea
BFR96	$ 2.75	2N3771	3.50
J310	1.00	2N3866	1.25
MRF134	16.00	2N4048	11.95
MRF137	24.00	2N4427	1.25
MRF138	35.00	2N5109	1.75
MRF150	87.50	2N5179	1.00
MRF174	80.00	2N5589	7.25
MRF208	11.50	2N5590	10.00
MRF212	16.00	2N5591	13.50
MRF221	11.00	2N5641	9.50
MRF224	13.50	2N2642	13.75
MRF226	14.50	2N2643	15.00
MRF227	3.00	2N5945	10.00
MRF237	2.00	2N5946	12.00
MRF238	12.50	2N6080	6.25
MRF240,/A	15.00	2N6081	8.00
MRF245	27.50	2N6082	9.50
MRF247	26.00	2N6083	9.75
MRF260	7.00	2N6084	11.50
MRF262	8.75	2SC1307	3.00
MRF264	10.50	2SC1946,/A	16.00
MRF317	56.00	2SC1947	9.75
MRF421	24.00	2SC1969	3.00
MRF422	36.00	2SC2075	3.00
MRF428	50.00	2SC2097	28.00
MRF433	11.00	2SC2166C	3.50
MRF450	13.50	2SC2290	16.75
MRF453	15.00	2SC2312	4.95
MRF454	14.00	2SC2509	9.00
MRF455	11.75	2SC2630	28.00
MRF458	20.00	2SC2641	16.00
MRF460	44.00	2SC2879	22.00
MRF475	3.00	3N204, 3N211	2.00
MRF476	2.75	40582	7.50
MRF477	11.75	*OUTPUT MODULES*	
MRF479	10.00	SAU4 450 MHz	55.00
MRF485 MP-KEN	18.00	SAU17A 903 MHz	50.00
MRF492	16.00	SAV6 150 MHz	42.50
MRF497	14.25	SAV7 146 MHz	42.50
MRF515	2.50	SAV12 146 MHz H.T.	23.50
MRF555	3.00	SAV15 222 MHz	48.00
MRF607	2.50	M57712,M57733	use
MRF630	4.25	M57737, SC1019	SAV7
MRF641	18.00	SC1027	use SAU4
MRF644	21.00	MHW710-2/3	61.00
MRF646	25.00	MHW820-2	89.50
MRF648	31.00	*TUBES*	
MRF660	10.75	12BY7A	7.95
MRF837	2.25	8877	649.00
MRF843	22.50	8875	call
MRF846	37.75	6146B	12.95
MRF873	24.50	6550	14.95
MRF901	1.25	6HF5	13.95
NE41137	2.50	6JB6	10.95
PT9847	21.00	6JS6C	14.95
RF120	22.00	6LQ6	15.95
SD1278-1	13.75	572B/T160L	69.95
SD1407	$25.00	4CX250B	79.50
SRF2072	12.75	3-500Z	114.50
SRF3662	24.00	3CX350A	call
SRF3800	17.50	3CX800A7	call
2N1522	11.95	3CX1200A7	call
2N3553	2.25	3CX3000A7	call

Hi-Gain, Matched, and Selected Parts Available
MATCHED TUBE FINALS IN STOCK FOR HAM EQUIPMENT
WE SERVICE ATLAS, ASTRO & SWAN—CALL FOR INFO

RF Power transistors in stock for Atlas, KLM, Collins, Yaesu, Kenwood, Cubic, Mirage, Motorola, Heathkit, Regency, Johnson, Icom, Drake, TWC, Wilson, GE, etc. Cross-reference on CD, PT, SD, SRF, JO, and 2SC P/Ns.

Quantity Pricing Available — COD / VISA / MC

Ship/Hand. 1 lb. U.S. or Foreign Sm Pkt Air 8 oz. $5.00

Orders received by 1 PM PST shipped UPS same day. Next day UPS delivery available

PARTS ORDERS ONLY — NO TECHNICAL
(800) 854-1927
ORDER LINE and/or TECH HELP
(619) 744-0728
FAX 619-744-1943

RF PARTS
1320 Grand Avenue
San Marcos, CA 92069

Number 37 on your Feedback card

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon, OH 44646

Back to Solar Power

This month we'll get back to solar power for your shack. In the past I've mentioned operating a ham station directly from a solar panel and battery. Energy storage is the key to successful solar electric operation. You should not connect a solar panel directly to your radio, since the open voltage of most solar panels is well over 20 volts. The results can just ruin your day. To operate directly from the sun's power, without battery storage in the circuit, use a small voltage regulator.

The circuit I used in the QRP 5'er works quite well. (Feb. '88 *73*) Of course, you don't need the transformer/diode setup if you're not using 110 volts, but I would keep the filter capacitor. It adds a small amount of storage, since it holds a charge. This allows for a slight drop in output from the solar panel, which occurs now and then as the clouds pass by overhead.

With the modified version of the QRP 5'er, you can operate standalone solar power. For a much simpler circuit, you can use a three-terminal voltage regulator chip. These chips handle up to one amp of current, and are quite small. You could easily install one inside a radio.

To use the regulators that come off the shelf at the local Radio Shack, you'll need to raise the ground lead above ground. This increases the output voltage of the regulator. For example, inserting two diodes in the ground lead of a 12 volt regulator will raise the output by 1.4 volts. A small voltage divider made of resistors will do the same thing. The object is to raise the voltage high enough to operate the radios. A good starting point is 12.6 volts, perhaps a tad higher. Of course, using either method, you can't operate at night or on cloudy days.

Ideal Conditions for Peak Power

When people talk solar power, the conversation always drifts to peak power. This is the amount of power a photovoltaic device can be expected to produce at solar noon on a cold, clear day under full, bright sun. The standard test for a photovoltaic cell was designed by the DOE (Department Of Energy) and the Jet Propulsion Laboratory. The standard test for peak watts include a cell temperature of 25°C, an insolation of 1000 watts per square meter, and an air mass of 1.5. Insolation, by the way, is the amount of sunlight striking the earth.

We now have to add two more conditions to our PV system. These are the nominal operating cell temperature and standard operating conditions. Nominal operating cell temperature is the temperature reached by a cell while it is functioning under standard operating conditions. Standard operating conditions include insolations of 800 watts per square meter, air temperature of 20°C, and a wind velocity of 1 meter per second. The panel would be oriented toward solar noon. The panel is measured open-circuit voltage.

What does all this mean? In the real world, we almost never find ourselves under full sun conditions. The ambient temperature is always higher, making the normal cell temperature much higher than expected. The results? The peak power of our panel will normally be reduced. If you purchase a 37 watt panel, you'll see about two-thirds of the potential output. On the other side of the coin, under better-than-standard conditions, you'll see more power being generated than the panel should be producing.

The Tilt of the Array

Now that peak power is no longer a mystery, we can move on to peak sun hours. Under a normal day's sun, we only get an average of four to six hours of energy producing sunlight. The amount of time the photovoltaic array produces full power depends, on where you live. Here in Ohio, I get about 4.5 hours in the summer and about 3.1 hours in the winter.

When building a photovoltaic array consisting of several panels, consider the tilt angle of the array. In the past, I never worried too much about tilt angle. However, with the improvements I have made on my array, I started to see a drop in power as we moved closer to summer. A good rule of thumb for tilt angle would be to add the latitude plus 15 degrees. This orients the array toward the low altitude angle of the sun in winter when the least amount of insolation is available. This is 30 degrees away from the best "summer tilt." If your loads are greatest during summer, then by all means re-tilt the array for the summer loads.

Battery Charge Regulation

In a photovoltaic system, charge controlling protects the battery(ies) from over charging. For example, if you have a small panel and average size battery, and you place some type of load on the battery now and then, you don't need a charge controller. Using a 105 amp per hour battery with a 0.8 mA panel, and operating on the weekends, you won't need a charge control system. Thirty amps into a large battery array, however, does require charge controlling.

"Energy storage is the key to solar electric operation."

There are two basic systems for battery regulation: relay and solid state transistor switching. The first type uses a relay to control the flow of current from the array. The second type uses a transistor switch. If the batteries are low, the control logic energizes the relay, or turn the transistor on, so current from the array can flow into the batteries. This is called series regulation. The control element—the relay—is in series between the array and the batteries. As charging progresses, the battery's terminal voltage rises. Using information from the battery manufacturer, you can approximate battery state of charge. The controller logic monitors the battery terminal voltage and decides when to stop the current flow by opening the relay or shutting off a transistor switch in a solid state series controller. In either relay or solid state series controller logic, the battery's terminal voltage flattens out near the end of its charge, and no longer accurately reflects the state of charge.

In a solid-state series regulator, the transistor must pass the full current from the array. Heatsink it well!

Shunt type regulators operate by diverting array power from the batteries as they reach full charge. This can be done in many ways, but the two most common methods are: shorting the panel to ground on the panel side of a blocking diode (switching shunt mode); and dissipating the energy as heat in the shunt transistor (linear shunt mode).

Energy Storage

The shunt mode controller has the advantage of allowing the batteries to float to maximum charge. This controller logic never completely stops the current flow. The series controller, however, stops all current when the battery voltage reaches full charge. Using only this one-step logic, the battery may never reach full charge. Most of the better series controllers also use a smaller, float regulator to charge the batteries the remaining 10% or so.

Usually the charging process stops just above the voltage at which electrolytic gassing occurs. This slight gassing mixes the electrolytes, which prevents their stratification and the consequent loss of battery capacity. Mixing the electrolytes is especially important in very large batteries, and that's where we'll pick up in the next column—energy storage and batteries.

In keeping with the theme of this column, I bought some small one- and two-watt Sovonic photovoltaic panels. They have no frame, but include a blocking diode. Both panels are flexible and quite rugged. Price for the one watt panel is $22.50, which includes postage in the USA and Canada. The two watt panel goes for $37.50. Power output for the one watt panel is 0.70 mA at 14.4 volts. Double the current for the two watt panel. I have only a few panels, so rush you orders.

Anniversary

This issue marks two years of QRP in *73*. I want to thank everyone who has sent in comments and photographs. There is quite a bit more coming down the pike. I hope to have some receiver projects soon. We will be doing more building, also. The DIY (Do It Yourself) keyer was a big hit.

Let's hear from you about your experiments with QRP and solar panels! 73

VISA

ICOM

MasterCard

VHF COMMUNICATIONS

FEATURING W2DRZ 902 MHz TRANSVERTER. NOW ONLY $299
FREE WITH PURCHASE 140 MHz 3W ATTENUATOR A $49 VALUE
DEALER INQUIRIES INVITED
ICOM, AEA, LARSEN, VAN GORDEN, VIBROPLEX, NYE-VIKING, FALCON COMM, LEADING EDGE, ARRL PUBLICATIONS, KAGLO, HAMTRONICS, PROWRITER, ELEPHANT DISKS, DEBCO, TRIONYX

915 North Main Street
Jamestown, New York 14701

Western New York's finest amateur radio dealer.

PH. (716)664-6345

CIRCLE 298 ON READER SERVICE CARD

TEKTRONIX SCOPE

AN/USM-281C (mil-TEK 7603N11S) Oscilloscope with 8x10 cm display and two AM-6565 (7A15N11) single trace and one TD-1085 (7B53AN11) dual time base plug-ins. Performs to 65 MHz but 100 MHz mainframe accepts standard 7000-series plug-ins for full versatility. Deflection 5 mv to 10 V/div in 11 steps. Sweep 0.05 us to 5 S/div in 25 steps; delay to 0.5 s/div. 11.5x9.7x25.2, 52 lbs sh. Used-checked w/book.....**$495**

WRITE or CALL for probe and adapter availability!

Prices F.O.B. Lima, O. • VISA, MASTERCARD Accepted.
Allow for Shipping • Write for latest Catalog Supplement
Address Dept. 73 • Phone 419/227-6573

FAIR RADIO SALES
1016 E. EUREKA • Box 1105 • LIMA, OHIO • 45802

CIRCLE 75 ON READER SERVICE CARD

BATTERIES

Nickel-Cadmium, Alkaline, Lithium, Etc.
INDUSTRIAL QUALITY

YOU NEED BATTERIES?
WE'VE GOT BATTERIES!
CALL US FOR **FREE** CATALOG

E.H.YOST & CO.
EVERETT H. YOST KB9X1
7344 TETIVA RD.
SAUK CITY, WI 53583
ASK FOR FREE CATALOG
(608) 643-3194

CIRCLE 112 ON READER SERVICE CARD

SYNTHESIZED
SIGNAL GENERATOR

MADE IN USA

MODEL SG-100F
$429.95 delivered

• Covers 100 MHz to 199.999 MHz in 1 kHz steps with thumbwheel dial • Accuracy +/– 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • External FM input accepts tones or voice • Spurs and noise at least 60 dB below carrier • Output adjustable from 5-500 mV at 50 Ohms • Operates on 12 Vdc @ ½ Amp • Available for immediate delivery • $429.95 delivered • Add-on accessories available to extend freq range, add infinite resolution, AM, and a precision 120 dB attenuator • Call or write for details • Phone in your order as fast COD shipment.

VANGUARD LABS
196-23 Jamaica Ave., Hollis, NY 11423
Phone: (718) 468-2720 Mon.–Thurs.

CIRCLE 79 ON READER SERVICE CARD

NEW!
MORSE TUTOR
Made Easy & Fun

Introducing the most Comprehensive and Easy-to-Use code course available today!
—MORSE TUTOR is available for IBM PC, XT, AT, PS/2 and compatibles.

FEATURING!

★ 1–100 word/minute code speeds
★ Standard or Farnsworth modes
★ Adjustable code frequency
★ Over 1 Billion possible random QSOs
★ Letter, number, and punct. mark coverage
★ Self calibrating/menu driven design
★ Display text—while listening or after copying

To Upgrade or learn CW, Send check or M.O. for $19.95 + $2 S&H to:

"Morse Tutor is, quite simply, a suberb value" Bryan Hastings, KA1HY July, 1988, 73 Magazine

GGTE

REFER TO QST JULY '88 P. 49

21881 Summer Circle, Dept. MTS
Huntington Beach, CA. 92646
CA. Residents add $1.20 sales tax
NOW AVAILABLE THRU UNCLE WAYNE'S BOOKSHELF, THE ARRL & FINE DEALERS EVERYWHERE

CIRCLE 339 ON READER SERVICE CARD

N6KW QSL Cards

The finest QSL Cards at reasonable prices. Basic cards, map cards, cartoon cards, photo cards and more. Your idea converted to ink, or use standard designs. 525 ink colors, any type of card stock. Photos in b/w or beautiful color. Have a card that fits your style. Call or write for free samples and details. Postage appreciated.

Chuck Miller N6KW
KW Litho - Dept. 73
P.O. Box 17390
Ft. Worth, TX 76102
(817) 332-3658

★ **OMAR ELECTRONICS** ★
FOR ALL YOUR AMATEUR NEEDS
SPECIAL PRICES on all
MFJ PRODUCTS ★ A.R.R.L. PUBLICATIONS
and other Ham Radio equipment!
VISA **404-466-3241**
OMAR ELECTRONICS • Omar Pupo WA8FON
RTE 1 HIGHWAY 81 SO. • LOGANVILLE, GA 30249

CIRCLE 292 ON READER SERVICE CARD

CB-TO-10 METERS

We specialize in CB radio modification plans and hardware. Frequency and FM conversion kits, repair books, plans, high-performance accessories. Over 12 years of satisfied customers! Catalog $2.

CBC INTERNATIONAL
P.O. BOX 31500X, PHOENIX, AZ 85046

MAO Electronics Company

PO BOX 6871, ALEXANDRIA VA 22306
CHUCK 703-360-5145 MARY
MICROPROCESSOR, DIGITAL, & LINEAR IC'S
FAST AND COURTEOUS SERVICE

MAIL ORDER SPECIALS

FRANKLIN ACE 1000/1200 KEYBOARDS $15
ACECALC OR DATAPERFECT SOFTWARE $10
80 COLUMN CARDS $40
7.37 MHz TURBO KIT FOR IBM PC'S $50
HARDWARE RESET KIT FOR IBM PC/XT $10
27256-20 $5 68764 $6 80287 $100
SSI-201 & SSI-202 DTMF CHIPS $7

NO MINIMUM ORDER, LIMITED QUANTITY

CIRCLE 320 ON READER SERVICE CARD

BUY FACTORY DIRECT
★ CALL TODAY ★
for lowest prices on
solar accessories

707-763-6173

HOLLY SOLAR PRODUCTS
P.O. Box 864
Peteluma, CA 94952
Ask for: Bill

CIRCLE 13 ON READER SERVICE CARD

AR-2002 Owners

Never buy another fast scan ATV receiver converter! Convert your AR-2002 Professional Monitor Receiver to receive VIDEO on 439.250 MHz, 910.250 MHz through 1289.250 MHz. AM or FM TV with our IF/Detector Modules.

Send SASE for information to:

Bill Trulock—ATV
P.O. Box 11254
Fort Wayne, IN 46856

CIRCLE 94 ON READER SERVICE CARD

HF Equipment	Regular	SALE
IC-781 Xcvr/Rcvr/ps/tuner/scope ...	5995.00	Call

IC-761 Xcvr/Rcvr/ps/tuner	2699.00	2369
HM-36 Scanning hand microphone	47.00	
SP-20 Ext. speaker w/audio filter ..	149.00	139.95
FL-101 250 Hz 1st IF CW filter	73.50	
FL-53A 250 Hz 2nd IF CW filter	115.00	109.95
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer.....	59.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1469
PS-35 Internal power supply	219.00	199.95
FL-32A 500 Hz CW filter (1st IF)....	69.00	
FL-63A 250 Hz CW filter (1st IF)....	59.00	
FL-52A 500 Hz CW filter (2nd IF)...	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)...	115.00	109.95
FL-33 AM filter.....	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	

IC-735 HF transceiver/SW rcvr/mic	1099.00	949.95
PS-55 External power supply.....	219.00	199.95
AT-150 Automatic antenna tuner ...	445.00	369.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply.....	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
MB Mobile mount, 735/751A/761A...	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal for 751A....	79.00	
PP-1 Speaker/patch.....	179.00	164.95
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan.....	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	139.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	659.00	589.95
AH-2A Antenna tuner system, only....	519.00	449.95
GC-5 World clock	91.95	79.95

ICOM

★ Large Stocks
★ Fast Service
★ Top Trades
at AES®

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1299.00	1069
IC-275H 100W 2m FM/SSB/CW	1399.00	1129
IC-375A 25W 220 FM/SSB/CW (c/o)	1399.00	899.95
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1099
IC-475H 75W 440 FM/SSB/CW.....	1599.00	1289
IC-575A 25W 6/10m xcvr w/ps	1399.00	1129
IC-471H 75W 430-450MHz base (c/o)	1399.00	989.95
PS-35 Internal power supply	219.00	199.95
AG-35 Mast mounted preamp	99.95	
AG-35 (Purchased with IC-471H)	99.95	9.95
SM-6 Desk microphone	47.95	
EX-310 Voice synthesizer	59.00	
TS-32 CommSpec encode/decoder....	59.95	
UT-15 Encoder/decoder interface...	34.00	
UT-15S UT-15S w/TS-32 installed.....	96.00	

VHF/UHF/1.2 GHz Mobiles	Regular	SALE
IC-37A 25w 220 FM/TTP mic... (c/o)	499.00	349.95
IC-47A 25w 440 FM/TTP mic... (c/o)	549.00	399.95
PS-45 Compact 8A power supply ...	145.00	134.95
UT-16/EX-388 Voice synthesizer ...	34.99	
SP-10 Slim-line external speaker ...	35.99	
IC-28H 45W 2m FM, TTP mic	499.00	439.95
IC-38A 25W 220 FM, regular mic	459.00	329.95
IC-38A 25W 220 FM, TTP mic	489.00	349.95
IC-48A 25W 440-450 FM, regular mic	459.00	369.95
IC-48A 25W 440-450 FM, TTP mic	509.00	449.95
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-228A 25W 2m FM/TTP scan mic...	509.00	449.95
IC-228H 45W 2m FM/TTP scan mic...	539.00	479.95
UT-40 Pocket beep function	45.00	
IC-900A Transceiver controller.....	639.00	569.95

★ Package Special ...
IC-900A Transceiver controller with **UX-29H** 2m/45W and **UX-39A** 220/25W band units.
$969.95

UX-19A 10m 10W band unit	299.00	269.95
UX-29A 2m 25W band unit.....	299.00	269.95
UX-29H 2m 45W band unit.....	349.00	319.95
UX-39A 220MHz 25W band unit....	349.00	289.95
UX-49A 440MHz 25W band unit....	349.00	319.95
UX-59A 6m 10W unit	349.00	319.95
UX-129A 1.2GHz 10W band unit ...	549.00	499.95
IC-1200A 10W 1.2GHz FM Mobile.....	699.00	549.95
IC-3200A 25W 2m/440 FM/TTP (c/o)	695.00	499.95
UT-23 Voice synthesizer.....	34.99	
AH-32 2m/440 Dual Band antenna ...	39.00	
AHB-32 Trunk-lip mount	35.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount....	22.00	
Larsen PO-MM Magnetic mount	22.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1529.00	1349
RP-2210 220MHz 25W repeater	1649.00	1469
RP-3010 440MHz 10W FM repeater...	1299.00	1149

Due to the size of the ICOM product line, some accessory items are not listed. If you have a question, please call. All prices shown are subject to change without notice.

MasterCard VISA

Hand-helds	Regular	SALE
IC-2A 2-meters.....	289.00	259.95
IC-2AT with TTP.....	319.00	279.95
IC-3AT 220/TTP (c/o)	349.00	269.95
IC-4AT 440 MHz, TTP	349.00	299.95
IC-02AT/High Power	409.00	349.95
IC-03AT for 220 MHz	449.00	289.95
IC-04AT for 440 MHz	449.00	389.95
IC-u2AT for 2m w/TTP	329.00	289.95
IC-u4AT 440 MHz, TTP	369.00	299.95
IC-2GAT for 2m, TTP	429.00	379.95
IC-4GAT 440MHz, TTP	449.00	399.95
IC-32AT 2m/440MHz	629.00	559.95

IC-u2A for 2m **w/o TTP**
Reg. $299 - **Closeout $249.95**

Aircraft band handhelds	Regular	SALE
IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	473.00	369.95
A-2 5W PEP synth. aircraft HT.....	525.00	479.95
A-20 Synth. aircraft HT w/VOR.....	625.00	569.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35 ...	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8.....	21.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35....	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CA-5 5/8-wave telescoping 2m antenna	19.95
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.65
CP-10 Battery separation cable w/chip	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs.....	25.99
LC-2AT Leather case for standard models.....	54.50
RB-1 Vinyl waterproof radio bag.....	35.95
HM-9 Speaker microphone.....	47.00
HS-10 Boom microphone/headset	24.50
HS-10SA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10.....	24.50
SS-32SMP Commspec 32-tone encoder	27.95

For other HT Accessories not listed please CALL

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver.....	$999.00	869.95
RC-11 Infrared remote controller....	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF).....	178.00	159.95
EX-257 FM unit.....	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker.....	65.00	
CK-70 (EX-299) 12V DC option.....	12.99	
MB-12 Mobile mount	25.99	
R-7000 25MHz to 2GHz scan rcvr	1199.00	1049
RC-12 Infrared remote controller....	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit.....	139.00	129.95
AH-7000 Radiating antenna	99.00	(15)

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3
Milwaukee **WATS** line: **1-800-558-0411** answered evenings until 8:00 pm Monday thru Thursday.
WATS lines are for Quotes & Ordering only, use Regular line for other Info & Service dept.

Order Toll Free: 1-800-558-0411 *In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195*

AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 • Phone (414) 442-4200

AES® BRANCH STORES — Associate Store

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (407) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside Illinois 1-800-621-5802

Life On A Megacycle

HF Aboard the Winnebiko

by Steven K. Roberts N4RVE

If you have been following these tales of my high-tech nomadness for awhile, you're getting a good image of the Winnebiko II—that 12-foot, 275-pound, 54-speed, solar-powered assemblage of gizmology that has become my electronic home. I've pedaled it 16,000 miles around the US, and am now hauling it to and fro in an old school bus, visiting hamfests and sponsors. Next spring, we'll hit the road again with a team of fellow nomads.

An increasingly important part of this life is ham radio. Not just the obvious convenience of two meters, but "classic" ham radio as well—HF. In this, the 9th article of our series, I'd like to discuss some of the issues involved in running 3–30 MHz while living full-time on the road.

Well, in last month's article I explored the various motives that drive us hams to do what we do. Near the end I admitted to feeling about a dozen of the seventeen mentioned . . . many of them quite strongly, given the sweat involved in making ham radio a part of my nomadic lifestyle. 2 meters, of course, is at the appliance/survival level—it keeps me in touch with Maggie, local hams, and the reassuring presence of autopatch facilities when I feel the need for security.

Steve Roberts N4RVE and the Winnibiko—A rolling caricature of the information age.

But what about HF?

First of all, why go through the hassle? Why haul a 25-pound "radio pack" up mountains? Why spend hours erecting dipoles just for the pleasure of uttering plaintive QRP calls into the cacophony of the airwaves?

Is there survival value in stringing a wet noodle in Montana trees, plugging together a few cables, and hunkering over a battered Argonaut while Maggie conjures camp glopola? Perhaps, in an extreme case, we might need medical help in the wilderness someday. But that's not what it's about, nor is it the pure fun of making contacts, nor the twisted pleasure in coloring in counties on my US map whenever I work a new one. And were it only the technical satisfaction of making an unlikely lash-up work, the thrill would have faded by my tenth QTH.

A Global Home

No, the value of this goes to the very heart of my wanderings, touching the same cravings that, five years ago, led me to trade my security for freedom and hit the road. A traditional home wasn't enough . . . I wanted a global one.

And, of course, it's now a question I hear almost every day: "What do you call home?" The answer has three parts . . .

On one level, home is the bike, the trailer, Maggie, and all the stuff we haul around with us. Home is also the whole world—a giant neighborhood that we prowl, visiting old friends and making new ones. But there's a third level, every bit as important as the other two: Dataspace. That's the vaporous global culture of electronically linked brains, made up of computer networks, BBS systems, the packet culture, and the planet-wide community of ham radio operators whose voices crackle through the bike's headphones whenever I say something like "N4RVE, bicycle-mobile QRP. QRZ?" Thanks in part to this series in *73 Magazine*, electronic doors open every time I go on the air and the security that comes from having an extended electronic family goes a long way toward delaying the urge to settle down.

But enough rhapsodizing. I get a lot of questions on the air about my bicycle-mobile HF rig, so here are a few details.

Pedaling The Megacycle

First of all, I should emphasize that this article comes at a time when the Winnebiko II

is undergoing major surgery...and will appear in a few months as the new improved Winnebiko III. The HF system is evolving along with everything else, and I have to resist the temptation to tell you about all of the NEW stuff before it's installed and working.

The heart of my present HF station is the Ten-Tec Argonaut 515 which, after a few months of flaky connectors, seems to work better and better the more it's abused. I carry an external audio filter, also by Ten-Tec, as well as one of Bob Heil's excellent headsets.

CW input is a function of whether or not I happen to be mobile. When in camp or visiting someone's house, I use the MFJ "Pacesetter" keyer, built around a smooth Bencher paddle. This is heavy, of course, with a steel block to keep it in one place on the desk. I'm machining a light aluminum base that can Velcro to a plastic work surface or snap onto the door of the HF area in the new trailer.

For CW mobile, I use the handlebar keyboard and a piece of Morse-generation softput to the bike's speech synthesizer, but then I'd never get to experience the magical rhythm of "Ben's best bent wire," or be able to participate in the shave and a haircut that terminates so many QSOs. There's pleasure in both extremes—feeling the bits between your toes and watching layers of machine intelligence do the work for you. Perhaps the best of both worlds: Decode incoming CW with a computer, log it to RAMdisk, and then regenerate perfectly-timed code (complete with spelling correction) for the brain's arcane pleasure. Hmm...

Anyway, the big issue that always arises in discussions of bicycle-mobile HF is the antenna. For a long time, I believed that mobile whips would be useless at QRP levels, especially with the dubious counterpoise of a bike (albeit a 275-pounder). I thus restricted my operation to campgrounds and backyards where I could uncoil my ropes and dipoles, terrorize neighbors with crescent wrenches slung over trees, and stay up beeping and squawking all night to get a return on my investment. It does work well...with Q-5 reports common, and frequent skepticism about my power levels. But I need to operate while pedaling.

Some time ago, I acquired an armload of Hustler mobile verticals, with super resonators and a folding mast. I gave it a try on 15 meters from somewhere in North Dakota (a QTH that added 10 dB to my 3 watt signal). Surprise...within a minute I had a three-way QSO going with Long Beach and New York. It works! I've started checking into the county-hunter's net bicycle mobile.

Still, there's pleasure in the dipole. I have flung it through a vent window in the peak of an Osceola barn, watched it flap wildly in Dakota winds, and tiptoed through southern gardens to untangle the rope. On the banks of the Yellowstone River, the wrench whistled past my ear and trashed a fender when I used a backing vehicle to get it unstuck from a 40-foot tree crotch. Something about a dipole in the trees seems to echo the spirit of ham radio, whatever that is, and every new QTH in my logbook has a header line that includes a sketch of antenna orientation and some comments about its mounting.

Speaking of the logbook, it is filling rapidly with the echoes of interesting contacts, many flagged with symbols indicating invitations or offers of assistance. Somehow, the essence of ham radio is clearer out here in the QRM and QRN—out here where contacts seem almost conspiratorial and surprises are frequent. In short, there's magic at our fingertips! (Which reminds me: don't forget to use the new CW exclamation mark, didahdahdidahdah, which is short for WOW. See my article in February's *73* for more on this.)

Life As A Roving Guest-Op

One of the most interesting spinoffs of being a full-time nomadic ham, of course, is the frequent experience of meeting other denizens of the airwaves. I'm getting to know all kinds of radios, for in every ham household there's a room full of boxes to investigate.

"Surprise . . . within a minute I had a three-way QSO going with Long Beach and New York."

I recommend that every ham try this: ask around on the air, swap a few invitations, and start spending a few hours a month at the helms of other peoples' stations. The education is unbelievable. You'll develop standards of comparison for competing rigs. You'll quickly spot differences in performance that can be hard to quantify. And, of course, you'll strenghten friendships, swap equipment and ideas, and learn more than ever about the hobby. Even though I've never had any kind of stable ham shack of any consequence, I frequently find myself in a consulting role—just because I've done time in so many others. I recently spent time with a good friend in Wisconsin whose HF rig didn't "feel" right...it turned out he was running a vertical with no radials.

I'm writing this month's column at the QTH of one of the big guns, KØPP in Deer Lodge County, Montana. Ken is an ARRL Section Manager, as well as the owner of the finest antenna farm I've ever seen (tribander, monobander, Zepp, 160 vertical, OSCAR, various VHF beams, and a forest of 75-foot towers). Driving all this is a TS-940 and a homebrew kilowatt. Ken's a hot CW DXer who can blister along at 30–40 WPM.

But he tuned up the linear, aimed the antenna east, and turned me loose. "Uh, me? A kilowatt?"

He grinned. Tentatively, I CQed. Instant response from the east coast. We chatted awhile, most of it comprised of my marveling at the rig and his marveling at a 40-over signal from Montana. Then, on a whim, I said QRZ after his final...and the roar of tangled voices was a sound I'd heard many times from the opposite perspective.

For four hours I sat in the hot seat, on a roll, buzzing with excitement. With the bike publicity, a killer signal, and a rare county in a rare state, I had a glimpse of how DX stations live. I started feeling guilty over ragchews, knowing that a dozen or so squirming stations were muttering "come on, come on" with every languid comment. I started responding to two or three calls at a time: "New Mexico, go ahead; Tango Yankee, you'll be next." And I twinged a bit when a QRP station in Georgia got over his delight at Montana only to say, "Steve? That doesn't sound like a solar-powered bicycle-mobile rig." Used to being a whisper in the wilderness, I was suddenly the most powerful thing on 20 meters. Strange and wonderful...and a little frightening.

But the best part was watching another few pieces fall into the infinite puzzle—seeing not only a new aspect of the hobby, but also learning about great circle bearings, radiation off the sides of tribanders, the nature of passband tuning, the subjective difference between 100 and 1000 watts, the etiquette of big-gundom, the use of a rotor brake, and countless other little things too small to enumerate but, in aggregate, a major education. And that's what it's all about, and why I recommend that you make a point of learning at a furious pace instead of falling into the tired habits that can make any hobby, along with its practitioner, seem old.

I sometimes forget that learning is the essence of this journey, for it is not so much passion as necessity. Without the stimulus of change and new people, I'd never have found the motivation to so actively pursue new information. Try this: Open doors with HF, pass through them, and explore whatever you find. Make the bandwidth of your participation in this hobby as wide as possible. Visit other stations, and get to know both rig and operator. Push past the same old skeds and contests, for the more interesting we become as a culture, the more we will attract interesting people. There's a critical mass somewhere, and it's becoming increasingly clear that it's not going to be reached through traditional public education.

But we of the networks and airwaves are in a unique position to find it, for we are dispersed across the planet, yet we communicate freely. Think of it as an intellectual responsibility to our species, as well as a whole new level of electronic fun.

Yep, bicycle-mobile HF sure is inspiring. See you somewhere on the air, on the road, or in the vapors of Dataspace! 73

[NOTE: For reprints of earlier articles in this series ($3 for all eight) or a copy of Computing Across America ($9.95 plus $2 for shipping), write to Computing Across America, 1306 Ridgeway Avenue, New Albany, IN 47150.]

Hi Pro Repeaters
MELCO
MAGGIORE ELECTRONIC LAB.

Manufacturers of Quality Communications Equipment

- Repeaters
- Links
- Remote Base
- VHF,UHF
- Receivers
- Transmitters
- Antennas

- Standard and Computerized Controllers
- Standard and Computerized Auto Patches
- Duplexers

Hi Pro 'E' EXPANDABLE REPEATER SYSTEM

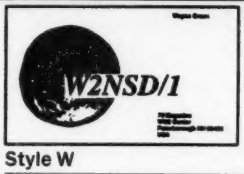
• A NEW CONCEPT IN REPEATER DESIGN, THE Hi Pro "E" IS AN EXPANDABLE REPEATER WITH THE FOLLOWING FEATURES: A BASIC REPEATER WHICH WOULD INCLUDE A COMPLETE RECEIVER, TRANSMITTER, COR, FRONT PANEL CONTROLS AND INDICATORS, LOCAL SPEAKER AND MIC JACK AND CAPABLE OF FUTURE EXPANSION. ALL HOUSED IN AN EXTREMELY RUGGED, ENCLOSED, 19-INCH RACK MOUNTABLE CABINET.
• THIS SYSTEM CAN BE EXPANDED AT TIME OF PURCHASE OR CAN BE AN AFTER-PURCHASE ADD ON. THE ADD ONS ARE—HIGHER POWER, 110/220 VAC POWER SUPPLY, IDENTIFIER, AUTO PATCH, OR COMPUTER CONTROLLERS. IN ADDITION TO THESE ADD ONS AN ADDITIONAL RECEIVER AND TRANSMITTER CAN BE MOUNTED INTERNALLY FOR USE AS CONTROL LINKS, REMOTE BASE OR DUAL BAND OPERATION, ETC.
• AN EXTENSION PANEL IS AVAILABLE FOR LOCAL MONITORING OF THE REPEATER AND CONTAINS ALL NECESSARY METERING, STATUS LIGHTS AND INDICATORS. ALL ADD ONS ARE AVAILABLE FROM THE COMPANY AND ARE COMPLETE INCLUDING INSTRUCTIONS.

MAGGIORE ELECTRONIC LAB.
600 Westtown Rd. West Chester, PA 19382 Phone (215) 436-6051 Telex 499 0741 MELCO

WRITE OR CALL FOR OUR COMPLETE CATALOG

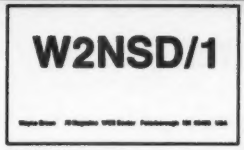
CIRCLE 47 ON READER SERVICE CARD

QSL Cards

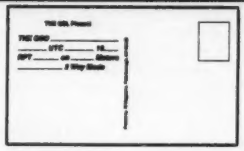


Style W

Style X



Style Y


Reverse

QSLs

Now you can get the highest quality QSL cards without spending a fortune! We put these cards on our press as filler between jobs; it gives the pressmen something to do and lets us print QSLs for you at an absurdly low price.

Not that we skimp: All three styles are produced in two colors (blue globe or satellite with black type). At these prices, you can start the new year out right by QSLing all those disappointed hams who've been waiting for your card. Tell 'em the card was printed by Wayne!

QSL Cards

Style: ☐ W ☐ X ☐ Y
Quantity:
☐ 100 @ $8.97 _____
☐ 250 @ $19.97 _____
☐ 500 @ $39.97 _____
Postage and Handling $1.00
For FIRST CLASS MAIL add an additional $1.50 for prompter delivery.

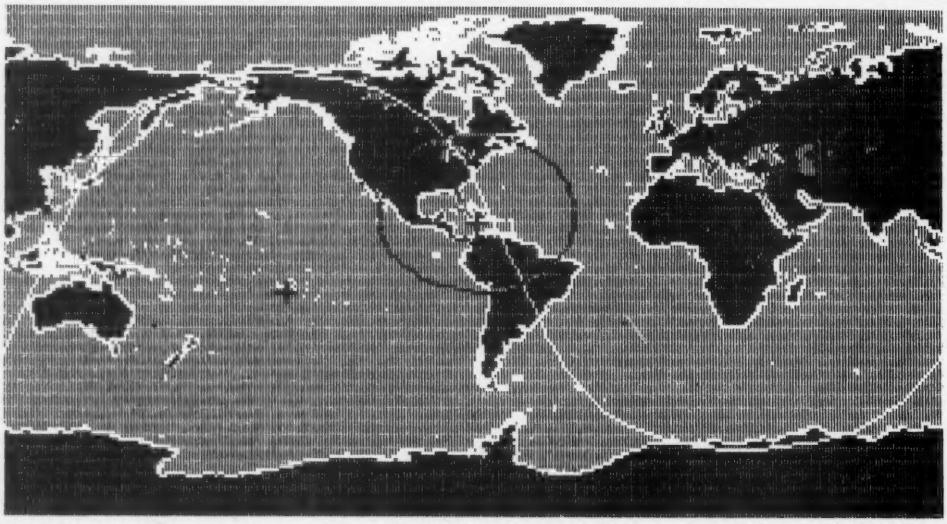
Please print!
Name _____ **Call** _____
Address _____
City _____ **State** _____ **Zip** _____
☐ AE ☐ MC ☐ VISA ☐ Check/MO
Card # _____ **Exp. Date** _____

Mail your order to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: Uncle Wayne.

Permission granted to photocopy

Satellite Tracking

with your PC and the Kansas City Tracker & Tuner



The **Kansas City Tracker** is a hardware and software package that connects between your rotor controller and an IBM XT, AT, or clone. It controls your antenna array, letting your PC track any satellite or orbital body. The **Kansas City Tracker** hardware consists of a half-size interface card that plugs into your PC. It can be connected directly to a Yaesu/Kenpro 5400A/5600A rotor controller. It can be connected to other rotor assemblies using our Rotor Interface Option.

The **Kansas City Tuner** is a companion product that is used in satellite work. It can provide automatic doppler-shift compensation for digital satellite work. Using our new **F-Trak** feature it can also slave the uplink radio frequency to the downlink radio's frequency. The **Tuner** is compatible with most rigs including Yaesu, Kenwood, and Icom. It controls your radio thru its serial computer port (if present) or through the radio's up/down mic-click interface.

The **Kansas City Tracker** and **Tuner** include custom serial interfaces and do not use your computer's valuable COMM ports. The software runs in your PC's "spare time," letting you run other programs at the same time.

The **Kansas City Tracker** and **Tuner** programs are "Terminate-and-Stay-Resident" programs that attach themselves to DOS and disappear. You can run other DOS programs while your antenna tracks its target and your radios are tuned under computer control. This unique feature is especially useful for digital satellite work; a communications program like PROCOMM can be run while the PC aims your antennas and tunes your radios in its spare time. Status pop-up windows allow the user to review and change current and upcoming radio and antenna parameters. The KC Tracker is compatible with DOS 2.00 or higher and will run under DESQ-VIEW.

Satellite and EME Work

The **Kansas City Tracker** and **Kansas City Tuner** are fully compatible with AMSAT's QUIKTRAK (3.2) and with Silicon Solution's GRAFTRAK (2.0). These programs can be used to load the **Kansas City Tracker's** tables with more than 50 satellite passes. We also supply assembled & tested TAPR PSK modems with cases and 110v power supplies.

DX, Contests, and Nets

Working DX or contests and need three hands? Use the **Kansas City Tracker** pop-up to work your antenna rotor for you. The **Kansas City Tracker** is compatible with all DX logging programs. A special callsign aiming program is included for working nets.

Packet BBS

The **Kansas City Tracker** comes complete with special control programs that allow the packet BBS user or control-op to perform automated antenna aiming over an hour, a day, or a week. Your BBS or packet station can be programmed to automatically solicit mail from remote packet sites.

Vision-Impaired Hams

The **Kansas City Tracker** has a special morse-code sender section that will announce the rotor position and status automatically or on request. The speed and spacing of the code are adjustable.

The **Kansas City Tracker** and **Tuner** packages include the PC interface card, interface connector, software diskette, and instructions. Each Kansas City unit carries a one year warranty.

- KC Tracker package for the Yaesu/Kenpro 5400A/5600A controller $189
- Interface cable for Yaesu/Kenpro 5400A/5600A ..... $ 19
- KC Tracker package with Rotor Interface Option (to connect to ANY rotors) $199
- KC Tuner (must be purchased with KC Tracker) .... $ 79
- Assembled & tested TAPR PSK modem with case & 110v power supply $219
- AMSAT QuikTrak software ..... $ 75

Visa and MasterCard accepted.
Shipping and handling: $5, $20 for international shipments.
Prices subject to change without notice.

L. L. Grace
Communications Products
41 Acadia Drive • Voorhees, NJ 08043 • U.S.A.
For more info: Telephone 609-751-1018
CompuServe 72677,1107

CIRCLE 11 ON READER SERVICE CARD

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston, TX 77083

AMSAT-OSCAR-13 is providing hams all over the world with satellite activity only dreamed of during the seventies. Its high apogee (point of orbit farthest from the earth) is now drifting northward, revealing the potential for great DX. When the satellite's position is favorable, stations in Europe and Asia can work each other. This should be true of most of the northern hemisphere by 1993.

The maps of groundtracks forecasting future orbital characteristics into the 1990s, that appeared in the September column, need to be modified. When the satellite controllers of AMSAT-DL (West Germany) raised the perigee (point of orbit closest to the earth) to 2545 km, they also affected the date on which the satellite will achieve its most northern apogee. Orbital plots show this to be about five years from now. Causing it to take ten years for the orbit to again have apogee over the equator. The general appearance of the groundtracks as seen in the September column will not change, just the dates associated with the maps.

Simply, The Best

This satellite, A-O-13, is the greatest accomplishment of the amateur satellite program. It achieved the orbit envisioned by its designers over a decade ago and most of the onboard systems perform flawlessly. Some concern still exists with the temperature sensitivity of the RUDAK packet radio experiment and the desense to the Mode L 23-cm uplink band by terrestrial radar, but as many hams have discovered, activity via A-O-13 is fantastic. Weekend activity via Mode B (70 cm up and two meters down) sounds like 20 meters with good band conditions.

In addition to typical one-on-one QSOs, other activities are beginning to appear in the passband. Nets and contests have been announced.

AMSAT nets have been active on Friday nights on both Modes B and L. Since the satellite is not always in a favorable position at the same time every week, these nets aren't easily scheduled. Check the AMSAT bulletins via packet networks, the bulletins on the 75-meter and 20-meter nets, and the *Amateur Satellite Report* for times and frequencies. Those interested should also check into the Space Education Net, held every Saturday. Again, check AMSAT sources for more information.

Contesting

The first contest to be announced for the hamsat community is a continuation of a program started on AMSAT-OSCAR-10 several years ago. It is the K2ZRO Memorial Station Engineering Award program. In this test of operating skill and equipment performance, a control station sends and repeats numeric code groups at different power levels. The satellite operators measure the receive sensitivity of their satellite station for comparison with other participants. Those who can copy the satellite's beacon can get started in this program.

The challenge of this program comes when the satellite enthusiast pursues endorsement stickers for station improvements on both Mode B and L reception. While the first code group is sent at beacon level, the power uplink is dropped by three dB, cut in half for the next. Subsequent levels are sent three dB down from the previous one until a level is sent causing it to be so low in power that the noise floor of the transponder enters into the equation. The ZRO Test, as it is commonly called, is the best opportunity to test system performance. For more information on this activity, send an SASE to me with two units (45 cents) of postage on a #10 (business size) envelope. Be sure to mark your request "ZRO brochure."

Other activities are in the works. The SATFOX hunt will offer a satellite-based foxhunt unlike any other transmitter hunt here on earth. Participants must use Doppler calculations and other measurements to determine the location of a terrestrial transmitter uplinking through the satellite.

Keep In Touch With The Times

Operating times for satellite activity change seasonally. The orientation of the spacecraft with relation to the earth is constantly modified for optimum sun angle. Unlike A-O-10 which can no longer be controlled due to memory loss, A-O-13's on-board computer is programmed to keep the satellite's solar array aimed at the sun. This causes the aiming of the satellite antennas to change, thus different portions of the orbit yield the best operating times for Modes L and S (70 cm up and 13 cm down), which have highly directional helix antennas. The satellite controllers here and overseas also program the computer to turn on the directional modes, when the satellite's antennas favor the earth. In late September the first schedule changes due to "offpointing" went into effect. Check the nets and *ASR* for updates.

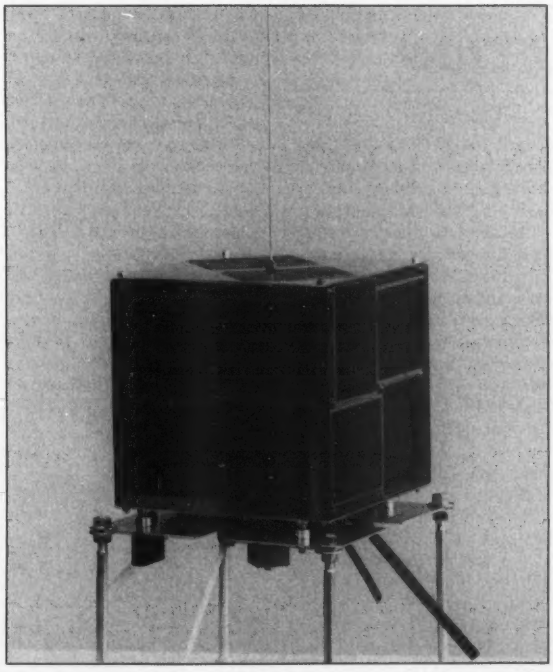
Mucho Dinero

OSCAR 13 was not cheap, straining the financial resources of AMSAT-DL and AMSAT-NA (North America). Both organizations have many new ideas and projects that must wait until adequate funding can offset the huge expense incurred by OSCAR 13. Estimates of A-O-13's value range from $250,000 to $750,000. A commercial or military satellite of the same caliber could cost as much as 10 to 20 million.

That $250,000 estimate doesn't include many expenses due to travel, transport, licensing, insurance, and launch-related costs. It also assumes that surplus equipment from A-O-10's development was used. The transponders in A-O-13 are the flight spares from A-O-10.

Although the ride to space was free, terrestrial transportation of the spacecraft was not. Just sending the satellite across the ocean a few times cost $20,000. Long before launch, A-O-13 had seen several countries on three continents. There were also travel expenses for the specialists involved in satellite construction.

AMSAT received very good rates for insurance. The premium was about 12 percent. AMSAT-DL and AMSAT-NA split the nearly $30,000 cost of covering a nomi-



AMSAT's new "Microsat" bus. This can carry a variety of sophisticated commercial and scientific payloads using a high-density, highly modularized design. Electronic mail is one of the first applications. At least four AMSAT Microsats will be launched in 1989 by Arianespace with the SPOT-II mission. [Photo by R. Jansson.]

nal $250,000. For AMSAT-NA this meant taking several thousand dollars from operations funds and the technical research budget. The insurance was necessary, and there was support from the membership, but the one-time lump-sum charge significantly drained the treasury.

Launch-oriented costs included engineering studies, system integration analysis and software development. Special hardware was built to mount the satellite with the other payloads onboard the Ariane 4 launcher. The cost of adding A-O-13 to the mission was about $100,000. There was no charge for the ride, but "there's no such thing as a free launch."

Considering the many hidden costs incurred during the development, construction and launch of A-O-13, a $500,000 estimate of worth seems more appropriate. Many of the drawings and flight spares were on hand at the beginning of the Phase 3C (now A-O-13) project. Phase 3A was built during the late seventies and Phase 3B (now A-O-10) was completed by 1983. To start from scratch with nothing except an idea, add another $250,000. In addition to being the highest repeater around, A-O-13 is also one of the most expensive.

Microsats

All the excitement surrounding A-O-13 sometimes eclipses news about another fascinating sat project—Microsats.

This project will send into space very small (nine inches on a side) special-purpose satellites. Two are to be packet radio systems, one will carry a speech synthesizer and the fourth is a CCD (charge-coupled device) camera experiment.

"... there's no such thing as a free launch."

Last month's "Hamsats" column reported a launch of the four Microsats in late 1989. The actual date could be as early as January, 1989. AMSAT Director Tom Clark W3IWI reports that a structural model of a Microsat was subjected to flight vibration qualification tests in late August. It passed at 14G with no problems.

The idea for Microsat-style packet-radio satellites first came up in early 1982, just after the first ARRL Networking Conference. This type of satellite would provide non-real-time worldwide communications using digital store-and-forward techniques via low-earth-orbit hamsats. Today Fuji-OSCAR-12 is an example of the type of communication system anticipated for the packet Microsats. Uplink and downlink formats would be nearly identical with Mode J operation using 1200 baud FM up with PSK (Phase Shift Keying) down.

In late 1987 the mechanics of the basic Microsat structure went from the ideas of premier satellite builders Jan King W3GEY and Gordon Hardman KE3D, to a fully-documented set of designs by Dick Jansson WD4FAB. The complete structure uses five 8" square module trays, 1.6" thick, stacked to create the inner satellite frame. A packet Microsat would include modules for receivers, batteries, the CPU (central processing unit) with memory, and a transmitter. The CCD camera experiment could use some of the same parts, but would also include a camera. The individual modules connect to the system via high reliability DB-25 connectors.

In early October, three papers concerning the Microsat Program were presented to the 7th ARRL Networking Conference. Tom Clark's paper gave an overview of the projects' goals. Another by Lyle Johnson WA7GXD and Chuck Green N0ADI described the flight CPU for the satellite. Harold Price NK6K and Bob McGwier N4HY presented the third paper with a description of the multi-tasking software that will be used to control the onboard systems.

For complete details of the inner workings of the Microsat program from AMSAT-NA, get a copy of the conference proceedings published by the ARRL. In just a few months the first group of Microsats could be in orbit. Thanks to design simplicity, many more Microsats could easily be built on short notice for future launch opportunities. ■

Number 19 on your Feedback Card

PROPAGATION

by Jim Gray W1XU

Jim Gray W1XU
PO Box 1079
Payson, AZ 85541

November 1988

DX conditions for November are expected to be quite good on all HF bands. The general rule is to listen *to the east of your location* between 10 AM and 2 PM local time on the 10–20 meter bands. As the earth rotates and the sun moves westward, skip conditions gradually move west with the sun. Between 4 PM and 8 PM local time, expect to hear stations *to the west of your location*. On the bands between 10 and 30 meters, look for excellent Pacific DX in the late afternoon and early evening. On the very good days when the magnetic field is quiet and the solar flux is high ("A" factor below 5 and "SF" factor above 135) expect to hear DX stations to the west of your location up until about 10 PM local time.

Early morning hours just before, just after, or at sunrise are the best times to work Pacific Ocean DX on the 30–160 meter bands, while late evening hours are the best for working DX to the east—to Europe and the USSR.

Be particularly aware that excellent signals are often propagated along the so-called gray line at dawn and sunset. There are several useful charts, as well as computer programs and hand calculators/slide rules, available to help you decide where signals are most likely to be heard at these times.

Lower atmospheric noise levels will help you on the 40, 80, and 160 meter bands during November.

DX stations from South and Central America and the Caribbean are best heard on 40–80 meters during the early evening hours. Earlier, in the afternoon, they come on the 10–20 meter bands.

Short skip on the various bands above 40 meters (10, 15, 20, and 30 meters) will prevail during the daylight hours, then increase in distance toward the late afternoon and early evening.

While late fall and early winter DX is not quite as good as spring and fall DX (because of fewer daylight hours), you will still find many good openings and opportunities this month.

Using the charts in conjunction with WWV transmission at 18 minutes after each hour is quite simple: record the Magnetic Field index (A) and the Solar Flux value for the time of day you listen. The values are usually updated every several hours or so.

Look for trends as well as values. Trends are given when WWV reports solar activity (low, moderate, or high) for the last 24 hours and expected values for the next 24 hours. It also reports geomagnetic field activity (quiet, unsettled, active) for the same periods. The best time to operate is when the geomagnetic field is *Quiet* and the Solar Flux is *High*.

In November, only 25–50% of the days will be good DX days. Use the daily calendar to note Good, Fair, or Poor (G,F,P) indications. Do not believe implicitly in the daily forecast, as Mother Nature always has a way of fooling the prognosticators. Historically, our forecasts have proven correct 75–80% of the time. At best, they are guides rather than rules. Remember that geophysical conditions are ever-changing, and that the most fun (and frustration, too) often occur at unexpected times. ■

NOVEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G	2 F	3 P	4 P	5 P–F
6 F	7 F–G	8 G	9 G–F	10 F–P	11 P–F	12 F–G
13 G	14 G–F	15 F	16 F–P	17 P–F	18 F–G	19 G
20 G	21 G–F	22 F–P	23 P	24 P	25 P–F	26 F
27 G F–G	28 F–G	29 F–G	30 F–G			

antenneX

"The mini-magazine for antenna experimenters"

DO YOU —

- Have a lousy mobile signal on all bands?
- Need an inexpensive directional antenna for 10 meters?
- Can't choose between a vertical or horizontal antenna?
- Need a low noise antenna for 160 meters?
- Want to design an antenna but don't want to redo the wheel?
- Need a program for antenna design and antenna plotting?
- Want to find out if someone else has solved your problem?
- Don't know what antenna is best for hamsats or others?
- Need a disguised mobile antenna for the car?
- Want a cheap automatic antenna coupler for any type rig?
- Just want to learn more about antennas?

THEN YOU MUST SUBSCRIBE TO - *antenneX*

antenneX is a mini-magazine for antenna experimenters from the new ham to the oldtimer. There is something for everyone. From computer-aided design to reference table of dipole measurements to a question and answer column. Everyone will find something of interest!

A one year subscription is only $11.97 for Continental USA and possesions. $17.00 for foreign surface mail.

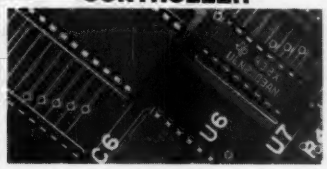
Send your subscription to:

antenneX

P.O. Box 8995 Dept. 19 Corpus Christi, TX 78412

CIRCLE 82 ON READER SERVICE CARD

SRC-10 REPEATER/LINK CONTROLLER



DTMF muting
Intelligent ID'er
Auxiliary outputs
Easy to interface
Alarm monitor input
Telemetry response tones
Low power CMOS, 22ma @ 12v
Detailed application manual
Programmable COS polarities
Repeater & link courtesy tones
Synthesized link/remote base capability

$149.00 *Assembled & Tested*

CREATIVE CONTROL PRODUCTS
3185 Bunting Avenue
Grand Junction, CO 81504
(303) 434-9405

CIRCLE 306 ON READER SERVICE CARD

Wideband Preamp 10-1000 Mhz

Dual GasFet low noise preamplifier for HF, UHF or VHF systems. Just perfect for the R-7000. Excellent for Spec Analyzers, Scanners, etc. Gain 20 Db +/- 1 DB, -3 Db at 2 & 1100 Mhz. 1 Db compression of >10 Dbm. Intercept points >45 Dbm. New shipped price of only $124.95. Pa. residents please add 6% state tax.

GTI Electronics
RD1 BOX 272
Lehighton, Pa. 18235
717-386-4032

CIRCLE 327 ON READER SERVICE CARD

GORDON WEST'S RADIO SCHOOL

21 DAY NOVICE

2 code tapes
112 page book
World maps
Frequency charts
Course certificate
Free magazine coupon
50 piece literature set!

$70 in equipment certificates from ICOM, KENWOOD, and YAESU **$19.95**

COMPLETE NOVICE COURSE $49.95
4 code tapes, 2 theory tapes, 2 text books, code oscillator set, examiner test packet, and $70 discount coupons.

NOVICE TEXTBOOK $4.95
Written by Gordon West, this 112 page book contains all Novice questions and answers.

NOVICE CODE COURSE $39.95
6 tape stereo code course for learning the code from scratch. Includes certificates.

TECHNICIAN THEORY COURSE $19.95
2 theory tapes & 2 textbooks.

GENERAL THEORY COURSE $19.95
2 theory tapes & 2 textbooks.

TECHNICIAN/GENERAL COURSE $19.95
Combined tech & general course with 4 tapes and 1 book.

THE COMPLETE GENERAL $49.95
4 tapes & 2 books for theory plus 6 tape stereo code set for CW speed building.

GENERAL CODE COURSE $39.95
6 tape stereo code course for CW speed building from 5 wpm to 13 wpm.

THE COMPLETE ADVANCED $49.95
4 tapes & 2 books for theory plus 6 tape stereo general or extra class code course. (Specify which CW tapes you want.)

ADVANCED THEORY CLASS $19.95
4 tape stereo theory course plus fully illustrated theory book.

THE COMPLETE EXTRA $49.95
4 tapes & 2 books for theory plus 6 tape stereo code set for CW speed building 13 wpm to 22 wpm+!

EXTRA CODE COURSE $39.95
6 tape stereo code course for CW speed building from 13 wpm to 22 wpm+.

EXTRA THEORY CLASS $19.95
4 tape stereo theory plus fully illustrated theory book.

GORDON WEST ELECTRONICS BOOK
200 page marine electronics book plus marine mobile antenna hints. **$19.95**

COMMERCIAL TEST PREP BOOK $29.95
BRASS CODE KEY & OSCILLATOR $19.95
PLASTIC CODE KEY & OSCILLATOR $14.95
COPPER GROUND FOIL 60¢ FOOT

SINGLE CODE TAPES

$9.95 EACH • BUY 2 GET 3rd ONE FREE

- 5 wpm Novice Tests • 5 wpm Random Code
- 5-7 Speed Build • 7-10 Speed Build • 10 Hump Jump
- 10-12 Speed Build • 12-15 Calls & Numbers
- 13 Random • 13 Test Prep • 5-15 General Quiz
- 13 Car Code • 13-15 Speed Build • 15-17 Speed Build
- 17-19 Speed Build • 20 Random • 20 Test Prep
- 20 Car Code • 10-24 Extra Quiz

Pass any upgrade & receive $25 Kenwood rebate
** plus a license holder & wall certificate FREE! **

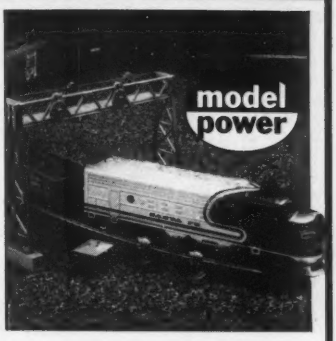
Slow code uses 13 wpm character speed. Same day service. Add $3.00 UPS for courses, or $1.00 for single tapes. 100% return policy.

GORDON WEST RADIO SCHOOL
2414 COLLEGE DR. COSTA MESA, CA 92626
Mon.-Fri. 10-4pm (714) 549-5000

CIRCLE 273 ON READER SERVICE CARD

COMB

Authorized Liquidator



SILVER CLOUD ELECTRIC TRAIN

Realistic Railroading! There's nothing like the excitement of an electric train to bring back memories, or to stir young imaginations. Be the engineer of this fun-filled HO-scale Model Train Set by Model Power featuring a lighted F-9 diesel loco. An overstock means tremendous savings for you. Take advantage of the **LOW liquidation price,** order this ready-to-run train TODAY. Perfect for enthusiasts 8 to 80!

- Powerful F-9 Lighted Locomotive.
- 3 Cross-Country Freight Cars. Plus, Red Caboose. (Cars May Vary From Photo.)
- 7-Pc. Snap-Together Signal Set Complete with 2-Track Overhead Bridge.
- Realistic 45" x 36" Oval Track.
- Cars, Track and Accessories Are Detailed Plastic and Sturdy Metal.
- Variable Speed Control Via the 120V U.L. Listed Power Pack (Included).
- Makes a Dynamic, Remembered Gift.

One-Year Limited Factory Warranty.

Mfr. List: $89.95

Liquidation Price $29

Item H-4103-7224-488 S/H: $6.50/set

Credit card customers can order by phone, 24 hours a day, 7 days a week.

Toll-Free: 1-800-328-0609

SEND TO:
COMB **Authorized Liquidator**
1405 Xenium Lane N/Minneapolis, MN 55441-4494

Send ___ **Silver Cloud Train Set(s)** Item H-4103-7224-488 at $29 per set, plus $6.50 per set for shipping, handling. (Minnesota residents add 6% sales tax. Virginia residents add 4.5% sales tax. Sorry, no C.O.D. orders.)

☐ My check or money order is enclosed. (No delays in processing orders paid by check.)

PLEASE CHECK: ☐ VISA ☐ MasterCard ☐ Discover ☐ American Express

Acct. No. _____ Exp. ___/___

PLEASE PRINT CLEARLY

Name _____

Address _____ Apt. #_____

City _____ State _____

ZIP _____ Phone (___) _____

Sign Here _____

73 Review

by Hal Mandel KA1XO

The Nye-Viking MB-V-A 3000 Watt Antenna Matcher

A solid easy-to-use tuner.

William M. Nye Co.
1614 130th Ave. NE
Bellevue WA 98005
(206) 454-4524
Price Class: $600

A tuner is a tuner is a tuner. Right? Wrong! The transmitter or linear amplifier may be happiest when looking into a 50Ω resistive load, but most real-world antenna systems don't provide this. One of the big measures of tuner quality is its ability to create an acceptable load from a variety of antenna systems.

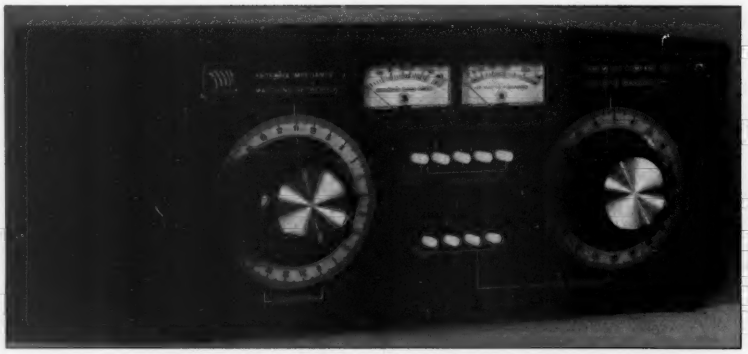
In 1984 I found myself with a six-slinky dipole, three to a side, fed in the center with a 450Ω ladder line. The 4:1 balun handled high power, and the wire loaded up anywhere from 1800 kHz to 29.9 MHz. The biggest problem with RF was on 40 meters. When I loaded up a new amplifier, the next thing heard, seen, and smelled was the RF ammeter frying away in the Maxwell Transmatch.

Considering the replacement of antenna matchers, I debated whether or not to build my own. After perusing blurbs of various flavors of antenna matchers, I took my chances and ordered an MB-V-A. The unit arrived in several days, in superlative packing. It could have been parachuted into New Hampshire without denting the merchandise.

Immediately upon arrival, I removed all the covers to see what the guts were like. Very impressive. I had no trouble believing the claimed rating of 3000 watts.

Six Features of the Nye MB-V-A

The components of the MB-V-A are different from other matchers I've inspected. First, the roller inductor is constructed by using an air-wound form, with the roller situated on the inside of the coil form, hanging on an arm which is rotated at the front end by a gear-driven assembly. This makes the roller turn faster than the hand crank. Whereas other roller inductors I've dealt with developed considerable momentum when spinning, this design is instantly controllable and easy to spin. The gear assembly affords some drag so that it doesn't feel cheesy. The control knob and associated planetary escutcheon on the front panel is calibrated completely around, and is of wide enough resolution to permit easy recognition and subsequent relocation when tuning up on the same frequency. The spinner knob is huge (2¾" in diameter), with an easily operated spin attachment (¾" by ½") on the front—great for guys like me with big hands. The skirt on the knob has a white line for easy resetting by noting where it lands at resonance.



The Nye Viking MB-V-A 3000 Watt Antenna Tuner.

Second, the variable tuning capacitor looks big enough to see service in broadcast equipment! Having experienced the syndrome of not enough plate separation in past days of building (I wondered what was being arc-welded when the RF jumped), I was overjoyed to find that Nye didn't skimp on their capacitors. The diameter of the entire variable, when fully unmeshed, approaches six inches, and is a good seven inches from front to back. The bearings are pre-lubed, and have a good feel when going around. They are driven by the 2-⅜ control knob on the front panel. The panel itself has a good bushing, so there's no side play on the shaft—something that happens with flexible insulated shaft couplings. The escutcheon is calibrated completely around, with two scales going from zero to one hundred in opposite directions. This enables the user to register and duplicate settings on both rotational segments of the variable capacitor. The black phenolic control knob has a white line on the skirt, immediately above the zero escutcheon dial registration, for easy placement of the dial's position when hunting for a number in a hurry.

Third, the tuner affords four values of fixed capacitance, above that offered by the variable itself, that may be switched in or out. As the manual states, there are "five different amounts of parallel capacity" available for the operator's use. The sections of fixed, high-voltage capacitors provide 160 picofarads each, and are switched by an interlocking arrangement controlled by four pushbuttons in the middle of the lower panel. This pushbutton system is extremely hefty, and from the looks and feel of it, will provide years of trouble-free service. The sections of fixed capacitance are shunted in and out of the tuning circuit by this mechanism, and the switch contacts themselves are silver-plated and spring-loaded.

Although the Nye Company expressly advises against hot-switching these capacitances in and out, I feel they are covering their equipment's protracted serviceability, especially for the types out there who would switch stuff in the RF output line at full power. Maybe five or so watts would be no problem, or even 500 by the looks of the switch gear, but I'll accept their recommendation anyway, and shut down when I fool with the buttons.

Fourth, the antenna switching arrangements found on the front panel are marvelous for tuning up. The five buttons are arranged as A direct, 2nd A, B, C, and D through the MB-V-A. The corresponding connectors on the rear apron are denoted A, B, C, and D. This feature allows the operator to access a dummy load by just pressing a front panel control, which bypasses the internal circuitry of the tuner. So tune up the exciter and linear, and then switch in the antenna system to a radio that's looking for a 50Ω non-reactive load. And do it with one button. That's great. The switches connect to the rear apron in the following manner:

"A" is direct through, and appears on a UHF-type SO-239 panel connector.

"A, MB-V-A" uses the tuner circuit in the above rear apron connection.

"B" through the tuner circuitry, appears on another UHF-type SO-239 panel connector.

"C" through the tuner circuitry, appears on a ceramic feedthrough insulator, and is the long-wire antenna connection.

"D" through the tuner circuitry, and through a 4:1 ferrite form balun transformer inside the tuner, appears as a pair of wire connectors on ceramic feedthrough insulators. This is the balanced line antenna connection.

Nye states the matcher will handle more than 3000 watts into loads between 40 and 2000Ω impedance, with an SWR of less than 1.1:1. They do, however, qualify the trifilar-wound balun as capable of matching balanced lines only between 200 and 1000Ω and unbalanced coaxial-line loads down to 20Ω. The Nye company specifies that the tuner is good from 160 to 10 meters. It is 36.8 centimeters wide (14.5"), 17 centimeters high (6.7"), 35 centimeters deep (12.25"), and weighs 6 kilograms (14 pounds). The manufacturer warrants these units for two years.

The switching gear in the antenna selection apparatus is likewise of good quality construction, with silver-plated contacts on spring-loaded armatures. This affords greater reliability. Once again, the operating manual warns against hot-switching the antenna buttons, prematurely fatiguing the contacts. The way this matcher is built, I'd lay odds on my rig frying before the matcher does.

Needless to say, the overall impression of the mechanical construction of the tuner is favorable, and is reminiscent of how equipment used to be built.

Dual Wattmeter

This is also known as the Forward and Reflected Power Meters. The tuner meter circuitry is operated by a self-contained nine volt transistor battery, with meter backlighting available with the application of 12 volts at 0.12 amperes to a rear-apron RCA connector. There's a front panel switch on the upper right corner for turning the lamps on and off. The meters display the level of power the system is generating and the antenna is reflecting. It's helpful to tune the matcher for the lowest reflected power settings on the meters. There's an LED below the meter which lights up when the meter-sensing circuitry shifts gears and displays on the 3000 watt scale. Normally, the meters display on the 300 watt scale. The circuitry resets to the lower power setting after five seconds of lower power, or no power, and this is one area in which I've encountered difficulty.

A Few Niggling Points

When tuning up the amplifier chain, the power meter jumps back and forth between scales, and though I try to keep the power level uniformly low, I encounter this bobbling between scales at the most inopportune moments. This is frustrating, as not only am I looking at the two meters on the matcher, but at other meters elsewhere at the same time. Rapid swings of the meters is cause for heavy breathing. Nye just released a stand-alone version of this wattmeter with controls to hold it in one scale or the other, and I hope this feature will be incorporated into the MB-V-A.

The only other difficulty with this unit was some scratchy noises in my receiver as I rotated the inductor knob. I lived with it for a while, then I took the unit apart, and cleaned the sliding and rolling contacts with chloroform to remove any contaminants, but to no avail.

KA1LAO was visiting one evening and he heard the noises. We yakked about it for a while and he thought of using powdered graphite on the roller inductor parts. I just happened to have a tube of "Mr. Zip" around, so we took the tuner apart and sprayed graphite powder onto all those parts that touch one another. Lo and behold, the scratches disappeared, thanks to Jim and Mr. Zip.

Finally, the instruction manual has helpful suggestions on antennas, gives diagrams of what's inside the matcher (although some of the schematic symbols are from the "1914 Guide to Wireless Telegraphy"), and details operational procedures well. There's a chart page on the inside rear leaf where the operator may log 21 Frequency/Inductance/Capacitance settings for four antennas, labeled "A, B, C, and D."

My overall impression of this piece of equipment was very good. I heartily recommend it for the amateur who wishes a tuner capable of handling high power levels, long duty cycles, and large mismatches. This machine will withstand high RF circulating currents, high voltages, and high temperatures. The components are good quality, and all in all, the MB-V-A 3000 Watt Antenna Matcher makes a worthwhile addition to any hamshack.

Number 21 on your Feedback card

73 Review *by Arliss N. Thompson W7XU*

Orion Hi-Tech 146 MHz Half Wave HT Antenna

Go from scratchy to full quieting signals with a switch to the whip.

Orion Hi-Tech
PO Box 8771
Calabasas, CA 91302
PH: (818) 888-4927
(800) 255-7020
Price Class: $20

Most of us soon tire of a rubber duck's marginal performance. Too often we are unable to work through a favorite repeater from certain locations in the neighborhood. Also, it's nice to more frequently be able carry on conversations in the low power mode rather than in the battery draining high power position. If so, then Orion Hi-Tech may have the solution to your problems.

The Orion 146 MHz half wave antenna is specifically designed for handie talkies. Finished in shiny chrome and equipped with a standard BNC connector to attach to your HT, this telescoping antenna measures nearly 42¾" long when fully extended. When collapsed for storage, its length is a more manageable 8½". For comparison, the rubber duckie that came on my Kenwood TR-2500 is just over 7" in length. No doubt about it, the Orion is a large antenna when mounted on a handie talkie, making it essentially a rigid antenna.

With the Orion's big size comes big performance. I did not attempt to measure the gain of this antenna. An HT half wave antenna design, however, generally has about 6 dB gain over a standard rubber duckie. Signals that were marginal to unreadable became easy copy when I replaced my stock HT antenna with the fully extended Orion. With the Orion in place, I was able to work stations who otherwise found my signal to be too "scratchy" when using the rubber duckie.

What are the drawbacks? The large size is an obvious factor. The antenna collapses to a size that is slightly longer than a standard rubber duckie, but it is not functional in that configuration. It is also rigid rather than flexible. The Orion half wave is no different from similar antennas offered by other manufacturers in this regard. The connector and the antenna are essentially one piece. Orion Hi-Tech may want to consider using a double spring BNC connector on the antenna for added flex. Exercise care when using any antenna of this size when mounted on an HT.

The Orion Hi-Tech half wave antenna is specified to handle 10 watts with a 10 MHz bandwidth, which should be more than adequate for all 2 meter HTs. It carries a 90 day guarantee. In addition to this half wave HT model, Orion Hi-Tech manufacturers a full line of other antennas.

Number 22 on your Feedback card

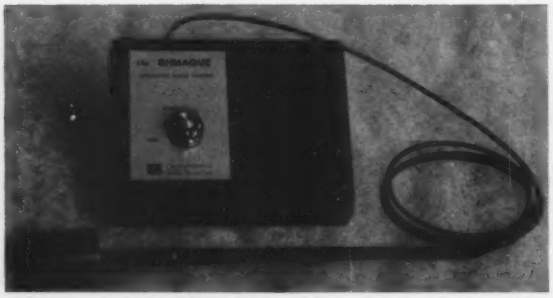
NEW PRODUCTS

Compiled by Linda Reneau

PRODUCT OF THE MONTH

UNIDEN CORPORATION OF AMERICA

Uniden's President HR-2510 Mobile 10 Meter Transceiver covers the 10 meter band from 28 to 29.7 MHz. You can operate on CW, AM, FM, and both sidebands, and choose steps of 10 or 1 kHz, or 100 Hz. Other features include preprogrammed 10 kHz channels, backlit LCD display, receive scanning capability, microphone with channel up/down select, frequency lock, auto squelch, noise blanker, RIT, and RF gain control. Ports to hook up key and external speaker. You can check your transmit power, received signal strength, modulation, SWR calibration, and SWR with the multi-function LCD meter. Suggested list price through distributors is $400. For more information, contact *Uniden Corporation of America, 4700 Amon Carter Blvd., Ft. Worth TX 76155; 817-858-3300.* Circle Reader Service number 201.



ELECTRON PROCESSING, INC.

The SHMAGUE, new from Electron Processing, Inc., is a sensitive audio signal tracer that picks up a current's magnetic field. By holding the SHMAGUE's wand near an object, you can listen to these signals without electrically or physically contacting them. Besides tracing audio signals on PC boards, you can safely identify AC power lines.

The SHMAGUE comes in a 5.3" x 4" x 1.5" housing. The magnetic wand is connected via a six-foot cable. Powered by a nine volt battery, and complete with internal speaker and volume control, the SHMAGUE is portable. A phono jack is provided for your scope or counter. Pricing starts at $60 with quantity discounts. *Electron Processing, Inc., PO Box 708, Medford NY 11763. Sales Department, 516-764-9798.* Circle Reader Service number 203.

ACE COMMUNICATIONS

Ace Communications, a subsidiary of AOR, Ltd. of Tokyo, announces a 100 channel hand-held receiver that offers complete public service band coverage. It is 5¾" x 2⅛" x 1¾" and weighs 12 ounces. Frequency coverage is 27–54 MHz, 108–174 MHz, 406–512 MHz, and 830–950 MHz. This covers all police, fire, and emergency bands, plus the new services above 800 MHz. Frequency stepping increments are 12.5, 25, and 30 kHz.

The AR-900 has twenty-five front panel keys, five banks of twenty programmable channels each, pairs of upper and lower limits for program scan, and five search memory locations. All information is stored in three permanent memories that retain their contents even after the batteries are disconnected. Antenna connects via a BNC connector.

Extra features include first channel priority, keyboard lockout, and a blue-green display backlight for night use. The LCD display offers 22 prompting annunciators. Price is $299. For more information, contact *ACE Communications, Monitor Division, 10707 East 106th Street, Indianapolis IN 46256; 317-842-7115. FAX 317-849-8794.* Circle Reader Service number 202.

CREATIVE CONTROL PRODUCTS

The UAI-10 Universal Repeater/Link Audio Interface board from Creative Control Products features DTMF Mute and link Monitor-Mix adjustable control. Audio inputs consist of repeater, link, control receiver, CW/Tone, and an auxiliary input for other audio sources. Audio outputs consist of repeater, link, and DTMF output for the DTMF decoder.

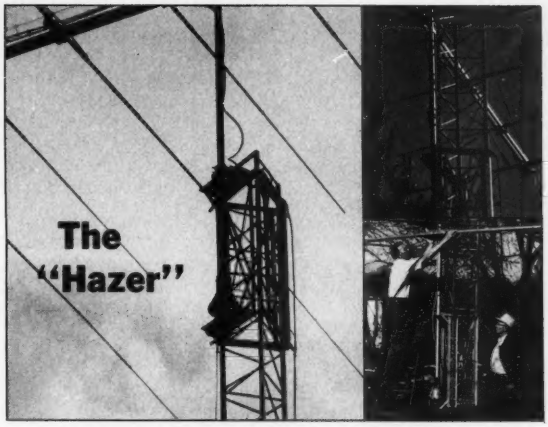
Control inputs to the UAI-10 consist of +8–15 VDC, repeater COS (high or low selectable), DTMF mute, and auxiliary output from your controller for the link mute function.

A jumper comes with the UAI-10 to enable you to mute or pass DTMF tones out the link transmit audio. Introductory price, $44. *Creative Control Products, 3185 Bunting Ave., Grand Junction CO 81504; 303-434-9405.* Circle Reader Service number 204.

INTERNATIONAL RADIO INC.

International Radio Inc. announces the IRI Tuning Upgrader which comes in three models for the TS-440, the TS-940, and the TS-930. The Tuning Upgrader lets you fine-tune incoming stations with ease, yet also move across the bands in seconds. Uses low-power CMOS circuitry. Has a speed indicator LED. Comes with clear instructions for installation.

Correctly installed, the IRI Tuning Upgrader will not void your Kenwood warranty. If you do not wish to do the installation yourself, International Radio can do it for $22.50 plus shipping. Each model is $34.95 plus $5 postage. Specify TU-440-541, TU-940-539, TU-930-540. *International Radio Inc., 751 South Macedo Blvd., Port St. Lucie FL 34983; 407-879-6868.* Circle Reader Service number 213.



PROTECT YOURSELF FROM THE HAZARDS OF YOUR TOWER

★ The HAZER brings the antenna and rotor down to you for safe and convenient maintainance and installation.
★ With your beam on the ground you no longer have to wait for spring to make those changes you always wanted.
★ Constructed of hot dipped galvanized steel with all stainless steel hardware, you reduce costly maintainance caused by oxidation and corrosion.
★ The HAZER is scientifically balanced for easy raising and lowering with the 1000 lb. manual winch and 100 ft. cable included. An optional power winch is also available.
★ The specially engineered safety lock guards against slippage and wind vibration while raising and lowering. It can never fall.

AVAILABLE MODELS

Hazer 2—Heavy duty alum. 12 sq. ft. load	$311.95 ppd.
Hazer 3—Standard alum. 8 sq. ft. load	$223.95 ppd.
Hazer 4—Heavy galv. steel 16 sq. ft. load	$291.95 ppd.
Ball Thrust bearing TB-25 for any of above	$CALL$

The HAZER has been designed for use with the Rohn 20 and 25 G tower or with our aluminum tower specifically engineered for use with the HAZER. We will soon be offering a model for the Rohn 45 and 55.

CALL 816-882-2734 TODAY

OUR EXPERT STAFF IS WAITING TO HELP YOU ASSESS YOUR NEEDS

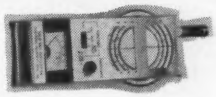
YOUR SATISFACTION IS GUARANTEED

GLEN MARTIN ENGINEERING INC
Rte 3 Box 322
Boonville, MO 65233

CIRCLE 72 ON READER SERVICE CARD

NOVEX

DM4061 Dip Meter *every ham needs one*



A must for every ham shack - check coils, tank circuits, antennas, use as RF generator, internal modulation, look for harmonics. 1.5 - 250 MHz 6 plug-in coils.
only $79.95 + $4 S&H

SWR-3P SWR/Power/Field Strength

- Measures output/SWR, while on the air
- 10 & 100 watt scales
- 1.7 to 150 MHz
- SO 239 conectors
- 5" whip antenna

only $19.95 +$4 S&H

PM330 RF Power Meter/Dummy Load

- 1.8 to 500 MHz
- 50 ohms "N"f
- 5/20/120 watt ranges
- measures your HF & HT power output

only $99.95 + $4 S&H

FC5250 Counter *know your transmit frequency*

- 10 Hz to 150 MHz
- 7 digits
- Accurate to ±1 count
- Gate times 1 or 5 sec.
- HF & VHF inputs
- Excellent for audio
- AC power adapter PA9P included

only $129.95 + $4 S&H

Orders: 800-368-3270 Local & tech info 703-658-5550
EEB Electronic Equipment Bank
5165 Mill St. NE, Vienna, VA 22180
(just minutes from Washington, DC)

DEALER INQUIRIES WELCOME

Ace Systems INTRODUCES THE *Opto Keyer* OFFERING

- ► BUILT-IN SPEAKER ► BATTERY OPERATED
- ► OPTO ISOLATED OUTPUT WITH NO MECHANICAL T/R SWITCHING
- ► REVERSE POLARITY PROTECTION
- ► SELF COMPLETING DOTS AND DASHES
- ► **POWER LOGIC** LED INDICATES KEYING AND BATTERY STATUS

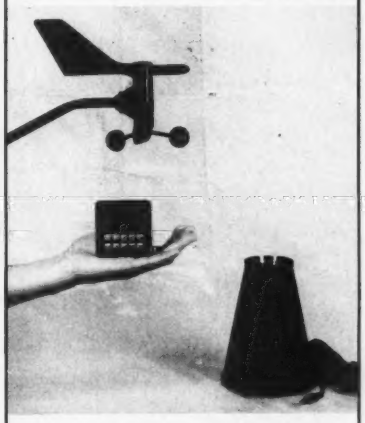
SPECIAL INTRO: $39.99XX
S&H $3 – COD'S ADDITIONAL $2

OUR WARRANTY IS THE BEST IN THE BUSINESS: All products guaranteed for 1 year under our ZERO CUSTOMER COST warranty. No charge for shipping and repairs.

Ace Systems (814) 965-5937
RD 1 BOX 83; WILCOX, PA 15870

CIRCLE 335 ON READER SERVICE CARD

WORLD'S SMALLEST WEATHER STATION



THE AMAZING WEATHER COMPUTER THAT YOU CAN HOLD IN THE PALM OF YOUR HAND.

DIGITAR's new TWR-3 Micro Weather Station includes a computer, precision wind vane and speed sensor with mounting hardware, and 40 feet of cable. For only $159.95. With the optional, automatic-emptying RG-2 Rain Collector ($49.95) you can even monitor rainfall!

- WIND SPEED
- WIND DIRECTION
- WIND CHILL
- WIND GUST RECORD
- TEMPERATURE
- HI/LOW TEMP RECORD
- RAINFALL (Optional)
- TIME OF DAY
- AUTO SCAN
- METRIC / STANDARD
- NICAD READY
- ONE YEAR WARRANTY

MAGNAPHASE INDUSTRIES, INC.
1502 PIKE STREET N.W.
AUBURN, WA 98001
MADE IN U.S.A. M/C & VISA
ORDERS ONLY: 800-322-1502
INFORMATION: 206-735-0374 FAX: 206-735-9044

CIRCLE 336 ON READER SERVICE CARD

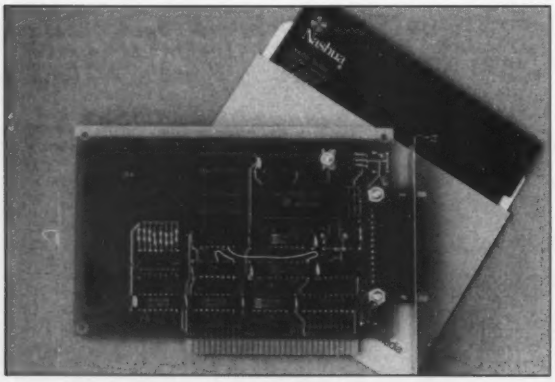
KLEEN LINE® SECURITY PRS II
FOR PHONE / MODEM / DATA LINES
GUARDED PHONE LINES 3, 4; 180V CLAMP
STRAIGHT THRU AUXILIARY LINES 2, 5
Electronic Specialists, Inc

ELECTRONIC SPECIALISTS, INC.

From Electronic Specialists, Inc., come the "Pocket Protectors" for portable computer protection. The AC Power Pocket Protector (LTP-101) combines filtering and spike/surge protection at 39,000 surge amp suppression.

The Modem Pocket Protector (LTP-201) combines multi-element spike suppression with RF filtering and balun noise filtering.

Each unit fits neatly inside a pocket. Price of the LTP-101 is $65, and the LTP-201 is $46. *Electronic Specialists, Inc., 171 South Main Street, Natick MA 01760; 800-225-4876 or 617-655-1532.* Circle Reader Service number 207.



L.L. GRACE COMMUNICATIONS PRODUCTS

The Kansas City Tracker, from L.L. Grace Communications Products, is an interface card and software package that plugs into the I/O bus of an IBM or compatible, and connects to your elevation-azimuth or azimuth-only rotor control box. It can control the Yaesu/Kenpro 5400A/B and 5600A/B Az-El rotors, or it can connect to other rotor controllers with the Rotor Interface option.

The Kansas City Tuner compensates for a satellite's Doppler shift. It can interface to ICOM, Kenwood, or Yaesu radios through the serial port or mike-click inputs. The KC Tuner can tune both links simultaneously.

The KC Tracker and Tuner can accept orbital positioning information from either GrafTrak or Quik-Trak. Software is Terminate-And-Stay-Resident (you can run other programs while your antennas and radios are controlled), and includes programs for automating PBBS antenna aiming to a user-defined azimuth and time. Vision-impaired users will appreciate the built-in Morse code sender that can announce rotor positions and satellite-pass status. *L.L. Grace Communications Products, 41 Acadia, Voorhees NJ 08043; 609-751-1018. CompuServe 72677,1107.* Circle Reader Service number 210.

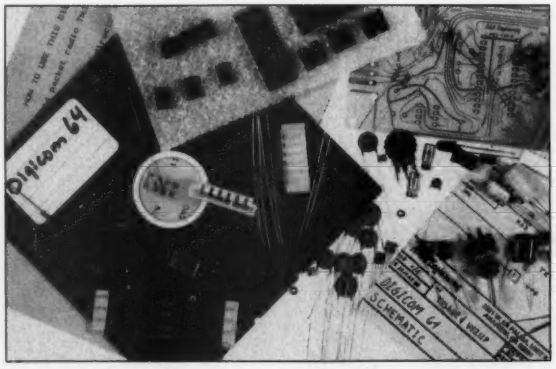
G AND G ELECTRONICS OF MARYLAND

Various products formerly manufactured by Microlog are now available from G and G Electronics of Maryland. The ART-1, AIR-1, and AIR-1 software are among these products. The SWL allows you to copy worldwide shortwave radio signals on your C-64/128. The SWL alone is $64. The AIR-DOS disk, which allows you to to save data, is $15. The MORSE COACH is $49.95. Package price is $99.95. *G and G Electronics of Maryland, 8524 Dakota Drive, Gaithersburg MD 20877; 301-258-7373.* Circle Reader Service number 216.

AMERICAN RELIANCE INC.

The AR-6400P Automatic Cable Tester from American Reliance, Inc., tests cables and wire assemblies of up to 128 test points, and it is expandable to a total test capability of 512 test points by the addition of plug-in I/O boards. It has a built-in parallel printer port, cable included, so that it can print test results and lists of wire. The AR-6400P sells for $995.

The 6401FX Universal Test Fixture is available as an option for $100. Connectors on the fixture include two each of 9, 15, 25, and 36 pin "D" types, and 37 and 50 pin Centronics types. *American Reliance Inc., 9241 E. Valley Blvd., Rosemead CA 91770; 818-287-8400.* Circle Reader Service number 209.



A & A ENGINEERING

Now among the many electronics kits and assemblies A & A Engineering has to offer, is the Digicom>64 by Barry N. Kutner, M.D., W2UP (see his article in the August 1988 issue of *73*). The Digicom>64 is a software-based packet radio system for the Commodore 64 which emulates the functions of a TNC. The PCB only is $10.65; the PCB and disk, $14.95; the kit with PCB and disk, $49.95; assembled board, $79.95; and disk only, $6. *A & A Engineering, 2521 W. La Palma, Unit K, Anaheim CA 92801; 714-952-2114. Stas J. Andrzejewski W6UCM, President.* Circle Reader Service number 215.

TECH TIPS

Non-Liquid Fix for the C-64 Stutter

With all respect to Bill Clarke WA4BLC, I believe I have improved, on his suggestion, about the best way to fix the Commodore 64 with a stutter problem.

As Clarke mentioned in his article (*73 Magazine*, July 1986), the C-64 has become a fixture around the ham shack. It serves such important purposes as word processing, logging, QSL design, and RTTY communications. Such a hardworking, useful instrument is bound to experience the occasional service problem, and one of the most common is the missed or repeated character.

The problem is the contacts under the keyboard develop a nonconductive coating that causes the stutter malady. The results take different forms, but they are usually aggravatingly apparent in embarrassing typographical errors on RTTY, or frequent use of the delete key in word processing.

"Remember the Golden Rule–keep water away from electrical circuits."

To remedy the situation, Clarke suggests the use of a mildly abrasive bathtub cleaner. Remembering my electrical basics, it goes against my grain to coat a circuit board with a liquid solution that is also an excellent conductor. Remember the Golden Rule of keeping water in all forms away from electrical circuits? So when I developed a similar problem with my C-64, I started looking for an alternative fix.

I followed Clarke's instructions about removing the three screws on the bottom, disconnecting the plugs and wires to the keyboard, and unscrewing the 23 tiny screws that hold the keyboard together. Carefully lifting the circuit board, I turned it over to reveal the green side with the contact points that require cleaning to fix the problem.

Here is where Clarke and I differ. Rather than taking a wet approach, my fix involves using a very dry pencil eraser in the same way used to remove pencil marks from paper. I recommend a Pentel Clic Eraser, which is a white, pencil-shaped eraser in a plastic holder. It is easily found at most office supply outlets. The eraser works so well on pencil mistakes (like they were never there), that I suspected it would clean the circuit board quite well, too. Guess what? It does the job perfectly, quickly and keeps the board away from the kitchen sink and possible short circuits.

By rubbing the eraser over the shiny contacts on the circuit board, and after the keyboard is reassembled, it will work as good as new.

So enjoy using the C-64 in all of its many versatile applications in the ham shack. And if and when the keyboard develops the stutter problem, feel confident that the user knows what caused it and how to fix it. Also remember that this has probably saved the user $30 to $100, for the technician repair cost, each time it is performed.

> Dust remover spray (available at Radio Shack) and the Pentel Clic Eraser make a great team when it comes to cleaning the Commodore 64 computer. Use the spray to remove the inevitable accumulation inside the 64, and use the eraser to clean the contacts on the keyboard circuit board as directed in the accompanying article.

ERRATA

Welcome Newcomers

Refer to the October 1988 issue, page 4. Look in the "Glossary" for the definition of *frequency*. Frequency is measured in *cycles per second*. One cycle per second is called one Hertz (Hz). Frequency is *not* "given in meters per second, commonly termed Hertz."

Also, refer to the definition of the *electromagnetic wave spectrum* on the same page and in the same section of the October issue. The last line should read that the microwave portion of the spectrum is typically set at "...1,000–300,000 *million* cycles/second." The word "million" was left out—which makes quite a difference!

Antenna Systems—September 1988

A minor typographical error in this article by John Lawson W3ZC, on page 11 pp10, operator j is incorrectly identified as the "square root" of 1, and, unfortunately, appears quite often in engineering." The square root of 1 is obviously still 1. Operator j is actually the square root of MINUS 1, and as it is physically impossible to quantize a square root as a negative number, it is properly referred to as an "imaginary number". 73

UNCLE WAYNE'S CODE TAPES

We've had so many phone calls from people wanting our famous 73 code tapes that we've decided to bring them back! *Isn't it about time you dust off that keyer and sharpen up your code skills? Order now...*

"Genesis"

5 wpm–This is the beginning tape, taking you through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

"The Stickler"

6+ wpm–This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

"Back Breaker"

13+ wpm–Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

"Courageous"

20+ wpm–Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the Extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run; you'll wonder why the examiner is sending so slowly!

Code Tapes

Genesis	$6.95	_ _ _ _ _ _ _
The Stickler	$6.95	_ _ _ _ _ _ _
Back Breaker	$6.95	_ _ _ _ _ _ _
Courageous	$6.95	_ _ _ _ _ _ _

Postage and Handling $1.00

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

☐ AE ☐ MC ☐ VISA ☐ Check/MO

Card # _____ Exp. Date _____

Mail your order to *73* Magazine,
WGE Center, Peterborough NH 03458

ORDER TOLL FREE (800)426-2820

AEA
10 METER
OR
6 METER
DX HANDY

AEA PK 232

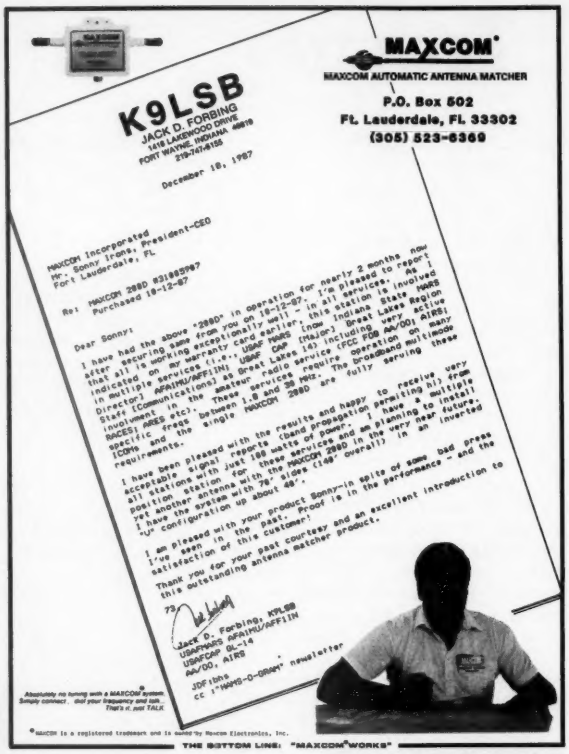
Your Choice $278.88

HAMTRONICS, INC.
4033 BROWNSVILLE ROAD
TREVOSE, PA. 19047
(215) 357-1400
Hours M,T,W - 9-6 Th - F 9-8 Sat. - 9-3

OVER 30 YEARS

Authorized Sales & Service --- Yaesu ▪ Kenwood ▪ Icom

CIRCLE 309 ON READER SERVICE CARD


MAXCOM
MAXCOM AUTOMATIC ANTENNA MATCHER
P.O. Box 502
Ft. Lauderdale, Fl. 33302
(305) 523-8369
K9LSB
JACK D. FORBING
1418 LAKEWOOD DRIVE
FORT WAYNE, INDIANA 46818
219-747-8155
December 18, 1987
MAXCOM Incorporated
Mr. Sonny Irons, President-CEO
Fort Lauderdale, FL
Re: MAXCOM 200D S/N885967
Purchased 10-12-87
Dear Sonny:
I have had the above "200D" in operation for nearly 2 months now after securing same from you on 10-12-87. I'm pleased to report that all is working exceptionally well - in all services involved. As indicated on my warranty card earlier, this station is involved in multiple services (i.e., USAF MARS (Major) Indiana State MARS Director) AF9AIMU/AFF1IN; USAF CAP (now Great Lakes Region State Communications) as Great Lakes (4) Incident Commander in the amateur service (FCC Great Lakes Region Incident) ARES etc). These services require operation on many specific freqs between 3.8 and 30 mhz. The broadband multimode ICOMs and the single MAXCOM 200D are fully serving these requirements.
I have been pleased with the results and happy to receive very acceptable signal reports (band propagation permitting) from all stations with just 100 watts of power. I have a multiple position station with these services and am planning to install yet another system with the 79" whip. I have a multiple "U" configuration up about 40'.
I am pleased with your product Sonny--in spite of some bad press I've seen in the past. Proof is in the performance -- and the satisfaction of this customer!
Thank you for your past courtesy and an excellent introduction to this outstanding antenna matcher product.
73,
Jack D. Forbing, KPLSB
USAFMARS AF9AIMU/AFF1IN
USNCSCAP GL-14
AA/DO, AIRS
JDF/hs
cc 1*HAMS-O-GRAM* newsletter
Absolutely no tuning with a MAXCOM system. Simply connect, dial your frequency and talk. That's it, and TALK!
MAXCOM is a registered trademark and is owned by Maxcom Electronics, Inc.
THE BOTTOM LINE: "MAXCOM WORKS"

CIRCLE 101 ON READER SERVICE CARD

NEW FROM GLB

GLB NETLINK 220
HIGH-SPEED DATA TRANSCEIVER

GLB Electronics is pleased to announce a fast digital-in, digital-out data radio, intended to further the development of the international amateur packet network.

Netlink radios are specifically intended for use in remote, unattended applications for long term service. Compatible with any digital format, they turn around (transmit to receive and receive to transmit) in less than a millisecond while holding keying transients within the channel. A digital sampling AFC tracks transmitted signals in frequency to maintain low error rates over long periods of time. In addition, they utilize crystal ovens and temperature-compensated circuitry for reliable operation at unheated sites.

FEATURES:
Conservative design
Data-transparent operation
Digital sampling AFC
5 Helical resonator front end
High-speed squelch supplies DCD
Oven-controlled oscillators
PTT, DCD, & PWR LEDS
PIN diode antenna switching
Transmitter timeout timer
Compatible with TNC2 controllers
Complies with all applicable Sections of Part 15 FCC Rules.

SPECIFICATIONS:
Data rate: 0 - 19,200 baud
Data format: any format incl. NRZ and NRZI
Modulation: FSK
Signal levels: TTL or RS232C
Frequency: 220 to 225 Mhz
Rx bandwidth: 30 Khz
Turnaround time: 1 ms TX
1 ms RX
Power output: 2 W min
Fuse: 3 Amp

Digital sensitivity: 5 uv for 1 error/K
Squelch response time: 1 ms
Spurious output: -60 dbc max
Power: 12 VDC
Operating temperature range: -30 to +60 degrees C
Antenna connector: BNC
RS232 connector: DB25S
Dimensions: 12 × 10 × 4 in.
Weight: 5 lbs. 8 oz.

Request our FREE catalog
Contact GLB for additional info and available options.
We offer a complete line of transmitters and receivers (single, prescaler, preamps, UHF/Sms & synthesizers) for amateur & commercial use.

See us at DAYTON Booth 318

Amateur net $ 699.95
List price $ 799.95
RIC & filter available

GLB ELECTRONICS, INC.
151 Commerce Pkwy.,
Buffalo, NY 14224
716-675-6740 9 to 4

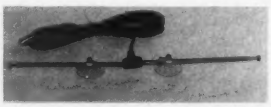
CIRCLE 17 ON READER SERVICE CARD

SUPER VAK-TENNA Only $149.95

500kHz - 800MHz ACTIVE RECEIVE ANTENNA

Kathy Sez: "These products are A-OK!"

The revolutionary SUPER VAK-TENNA advances the state-of-the-art by providing superb reception, extremely wide coverage, small size and SUCTION CUP MOUNTING in one compact antenna! Low noise/High gain 14 db (or better) active amplifier is built in for unsurpassed reception. A female BNC connector connects to your receiver. 15 feet of coax cable and 115VAC power unit are also supplied.



SUCTION CUP MOUNT VAK-TENNA!
Only $29.95

IDEAL FOR APARTMENTS OR OFFICES!

Mount this antenna to your window for the BEST coverage. Two VERY powerful suction cups hold firmly for weeks. Whips telescope to 79" yet fold to only 12". **This antenna is a MUST for people who travel!** Receives 30-500 MHz or transmit 70-230 MHz with up to 50 watts! Complete with 15' of coax and choice of PL259, BNC, Motorola or F connector.

SIGNAL INTENSIFIERS
Priced from $29.95

A HEARING AID FOR YOUR RECEIVER OR SCANNER!

- The State of the Art in WIDEBAND preamps!
- Make small antennas perform like BIG ones!
- Fully Assembled and BUILT TO LAST!
- 110 VAC or 12 VDC powered!
- VHF/UHF or MF/HF available!
- Many models! Send for specs!

Add $3 Shipping/Handling.
NY add Sales Tax.

ELECTRON PROCESSING, INC
P.O. BOX 708
MEDFORD, NY 11763
(516) 764-9798

SATISFACTION GUARANTEED!
Order any product (except software) from EPI and if not satisfied return it within 15 days for a full refund (less shipping/handling).

SEND FOR MORE DETAILS! US MADE!

CIRCLE 291 ON READER SERVICE CARD

Dx

Number 24 on your Feedback card

Hams Around the World

Chod Harris VP2ML
PO Box Box 4881
Santa Rosa CA 95402

DXing on 160 Meters

Contacts that are routine on 15 or 20 meters can range from difficult to impossible on Top Band. Yet despite the obstacles (or perhaps because of them), hundreds of DXers have worked more than 100 countries on the band, enough to qualify them for the first single-band DXCC award: 160-meter DXCC.

Antennas For 160 Meter DXing

Far more than on other bands, the antenna for 160 meters can make or break a DX contact. Unfortunately, the simplest antennas to put up are the least effective for 160-meter DXing. Specifically, tying the feeders of an 80-meter antenna together and operating through a tuner will produce an antenna that emphasizes local, rather than DX contacts. Similarly, a low dipole or inverted-Vee makes a poor DX antenna on Top Band. An antenna design that works fine on higher bands is often a marginal performer on Top Band, because a horizontal antenna should be at least one wavelength in the air for the best DX. On Top Band, that's more than 500 feet high!

The beginning 160-meter DXer can make contacts with a loop, inverted-Vee, or half-wave sloper, especially if the apex of the antenna is 80 feet or more in the air. Hanging a full-wave loop off the tower is one of the simplest approaches to a 160-meter DX antenna.

If the DXer already has a tower or other tall support, however, an inverted-Ell or Tee antenna is much more effective than low loops. Construction of an inverted-Ell is simple: run a wire from the ground to near the top of the tower, and then out horizontally as far as necessary to resonate on 160. The longer the vertical portion of the antenna, the better it will work for DX. With two high supports (such as suitably spaced trees), a Tee antenna is often very effective. In either case, a simple tuning network can lower the input impedance of the antenna to near 50 ohms. Both antennas require good-to-excellent ground systems to work well, a factor often overlooked by DXers.

By far the best antenna for 160-meter DXing is a vertical with a good ground. Since few amateurs can erect a 130-foot, quarter-wave vertical, some type of shortened antenna is the norm. Shunt-feeding an existing tower, or loading short verticals are typical approaches to DX-transmitting antennas, especially if operated against a good ground system. The enterprising Kansas City (MO) DX Club once used helium balloons to support their 128-foot vertical!

What constitutes a good ground? A salt-water marsh, 132 ¼-wave radials, or a copper plate 250 feet in diameter, work well. The 160-meter DXer will more likely put down as many radials, as long as possible, and hope for the best. One top-bander has buried old washing machines, refrigerators, and more than 5 miles of elevator cable under his vertical!

Receiving Antennas and Noise

Unfortunately, the best antennas for transmitting on 160 meters are among the worst for receiving. Vertical antennas concentrate much of their radiation in low angles for best DX, but they are also very susceptible to noise. QRN is often the limiting factor in top-band DXing, so most 160-meter DXers erect separate antennas for receiving.

The best antennas for receiving DX on 160 meters are terrible antennas for transmitting: beverages and small loops. Either of these antennas will be as much as 50–60 dB worse than a dipole, so they are useless as transmitting antennas. The good news is that they receive noise even worse than they receive DX signals, so they produce a higher signal-to-noise ratio than other antennas.

For DXers with access to lots of real estate, the beverage antenna works very well. Active Top Bander WB9HAD runs three 1000-foot wires out over his farm after harvest every fall, and rolls them up in the spring before planting season. The beverage can be as simple as a long wire stretched out in the desired direction. Terminating the beverage with a resistor to ground at the far end will make the antenna unidirectional, but most DXers omit the terminating resistor, and live with the bidirectional characteristics of the beverage. The beverage will work even if it must bend around houses, is stuck in a gutter, or run along fence posts. The important thing is total length (at least a few hundred feet), and some sort of matching and amplification system at the receiver end.

"By far the best antenna for 160-meter DXing is a vertical with a good ground."

To get maximum performance from a beverage, the Top Band DXer should make a small 9:1 impedance matching transformer out of a ferrite ring, and use a preamplifier to boost the very weak signal levels. The DXer must also make some arrangement that prevents accidental transmission into the receiving antenna, or be prepared to buy a lot of replacement preamps. Using the separate receiving antenna jack on the rig (or modifying the rig for such a jack) is the best bet. If the DXer takes the simple approach of installing a separate switch to change antennas between transmit and receive, he will transmit into the wrong antenna while calling some rare DX, with disastrous results.

Space-restricted DXers can resort to a small loop antenna. By rotating the loop, the DXer can reduce much of the noise that would otherwise mask weak DX signals. Hint: try tilting the loop, as well as rotating it, for minimum noise. As with the beverage, some means of impedance matching, preamplification, and receive/transmit antenna selection are essential for best performance.

Finding and Working DX

One of the frustrating aspects of 160-meter DXing is that not all countries allocate the band to amateurs. With Loran-C use declining in the US, stateside hams have access to more of the band, and fewer power restrictions, but other countries still use the frequency range for radio location, and discourage or prohibit amateur use of the band. Among the countries with no 160-meter amateur operation are Lebanon, Liberia, and Morocco. Up-to-date allocation data is available free from IARU Headquarters (c/o ARRL), or for $4 from N7CKD.

Because many countries restrict Top Band amateurs, much DXing is done with wide splits. The DX stations transmit in the 1825–30 kHz range, and listen near the bottom of the band: 1800-1810 kHz. This split is too wide for most RIT controls, so the 160-meter DXer needs a second VFO or other means for using wide splits. Unfortunately, many local ragchewers hover around this "DX window," often covering up the DX stations.

Some Asian countries (notably Japan) restrict their amateurs to a narrow "window" high in the band, typically 1907–1912 kHz. Again, these stations listen for contacts near the bottom of the band.

During the daytime, high absorption levels limit 160-meter contacts to a few hundred miles at best. Serious DXing on Top Band is a nighttime activity, with DXing often improving as the night wears on and man-made noise sources are turned off. Even at night, absorption limits DX, especially over the noisy polar path. The best times for 160-meter DXing are the long nights in the middle of the winter, when the absorption is extremely low. The bottom of the sunspot cycle provides the best DX opportunities, thanks to lower absorption.

Gray-line propagation provides a big boost to weak 160-meter signals. The Top Band DXer looks for DX to the east at his local sunset, and to the west at local sunrise. He also has access to sunrise/sunset times for other countries. The best time to work European DX is sunrise in Europe, for example.

Many active Top Band DXers spend much of their operating time on higher bands, especially 20 meters, talking to DX stations about getting on 160 meters, and arranging schedules. "When are you going to be on 160?" is a frequent question directed at DXpeditioners, for example.

DXing on Top Band is a challenge, and the casual operator will soon tire of the static crashes, incessant noise, the local rag-chewers transmitting on top of rare DX, and the late hours. But for the dedicated DXer, 160 meters offers many rewards and satisfactions. Try it this winter!

AERIAL VIEW

Antenna News

Arliss N. Thompson W7XU
RR 3, Box 224
Sioux Falls, SD 57106

Going Horizontal

When someone talks of going mobile with their VHF or UHF rig, what does that bring to mind? For many hams it implies FM and repeaters, with a ¼- or ⅝-wave vertical antenna secured to their vehicle's roof with a mag mount. To them, 2 meters is synonymous with FM. Though repeater operation may be fun, there is more to the world of mobile operation at VHF and above than autopatches and squelch tails. What I am referring to, of course, is SSB (and even CW!).

If you never tried working SSB on 2m while mobile, you may be wondering why anyone in their right mind would forsake the vast network of repeaters that exists in this country, and attempt to work other stations directly. One reason is that, under weak signal conditions, sideband has a considerable signal-to-noise ratio advantage over FM. With enhanced conditions, the folks on FM may be commenting that the signal from the repeater seems just a bit stronger today, while a couple of MHz away SSB operators may be working stations several states distant. Sound like fun? It is!

A Catch

If you want to try operating from a mobile on VHF SSB, be aware that it may not be quite as simple as flipping a switch from FM to USB on the multimode transceiver. While FM repeater operation is universally vertically polarized, most base stations on the narrow-bandwidth modes use horizontal polarization. Simply going from FM to SSB without changing the antenna results in a significant loss of signal due to cross-polarization, often 20 dB. You can still work stations on the vertical antenna, but a horizontally polarized antenna gives you a markedly greater operating range. While not as familiar to most amateurs as a vertical ⅝-wave mag mount, there are several types of antennas that are relatively omni-directional, and yet are horizontally polarized. These antennas are adaptable for mobile use, are easy to build, and can be designed for any of our VHF/UHF bands. Thismonth's column focusses on four examples of such antennas.

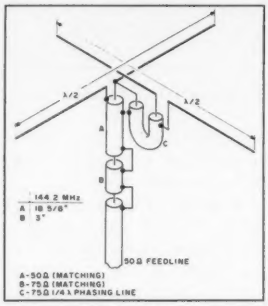


Figure 1. The turnstile, or crossed dipole, antenna.

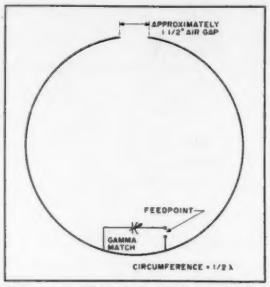


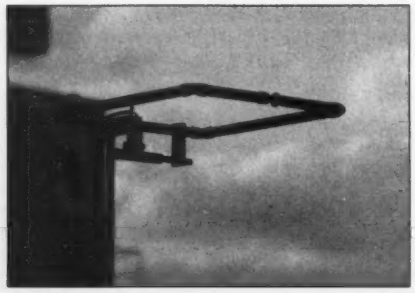
Figure 2. The halo antenna. The radiator can be fashioned from ¼" aluminum rod or copper tubing. For the 2 meter band, its length would be 38⅜".

> ***"20-dB is a lot of signal strength to give up."***

"X" Marks The Spot

A schematic diagram of the turnstile antenna appears in Figure 1. This antenna consists of two dipoles mounted at right angles to each other and fed 90 degrees out of phase. Placing a quarter-wavelength of feedline between the feedpoints of the two antennas effects the phase shift. Remember to take into account the velocity factor of the coax used for the phasing section when computing coax length.

The matching section shown in Figure 1 was designed for the 2 meter band using the short BASIC program that appeared here in the August 1988 issue. Most versions of the turnstile use a 75Ω phasing section, a 50Ω quarter-wave transformer, and a 75Ω feedline. The use of a series-section transformer allows the use of a 50Ω feedline, as shown. Photo A shows a completed turnstile. Since a car's roof looks like a large reflector at VHF, an turnstile mounted too close to the vehicle will have most of its signal directed vertically upward, rather than toward the horizon. When possible, place this antenna (and the others described here), at least ½-wavelength above those reflective surfaces.



Photos A–D. Horizontal mobile antennas for VHF/UHF.

Heavenly Alternative

Another common VHF/UHF SSB mobile setup is the halo antenna. It appears in Figure 2. The halo is basically a half-wave dipole that is bent to form a circle (or, as shown in Photo B, a square). It is frequently fed via a gamma match. The version I built for the 2 meter band (Photo C) used a ¼" diameter gamma rod 5" long, spaced ¾" from the ¼" diameter radiator. The match's capacitor was approximateley 20 pF. The dimensions of the matching device, and the value of the series capacitor necessary to obtain a 1:1 match, will vary with the antenna's height above ground. The above numbers

New Scanner by AOR

100 Channels
800 MHz

- Includes antenna, rechargeable battery, charger/adaptor & belt clip. Full range of optional accessories available.
- Covers 27-54 MHz, 108-174 MHz, 406-512 MHz, and 800-960 MHz.
- 5 Scan Banks and 5 Search Banks.
- 25 Day Satisfaction Guarantee, Full Refund if not Satisfied.
- No Frequencies cut out.
- Size: 2" x 5¾" x 1½" wt: 12 oz.

AR900
Total Price, Freight Prepaid (Express Shipping Optional)
$299.00

ACE COMMUNICATIONS
10707 E. 106th St. Indpls., IN 46256
Toll Free 800-445-7717
Visa and MasterCard (COD slightly higher)
In Indiana 317-849-2570 Collect FAX (317) 849-8794

CIRCLE 355 ON READER SERVICE CARD

Multiband QRV Dipole/V/Sloper

Ready to Use		Full Legal Power
Fastest Install	Tough	No Lossy Traps
Coax Feed	Flexible	Low Noise
2500 V Insul	Kink-Proof	Never Corrodes

QRV-80-10 **$49.95** 51 ft. long
QRV-160-10 **$59.95** 102 ft. long
Includes 52 page Tech Manual. Add $5 Post & Handling.

Infopack $1 by 1st class mail.
Box 50062-S, Provo, UT 84605
AntennasWest
(801) 373-8425

CIRCLE 236 ON READER SERVICE CARD

PERSONALIZED MUGS
Your Call sign & ARRL logo on a 10 oz. coffee or 15 oz. beer mug
A GREAT GIFT IDEA OR CLUB AWARD
10 oz. Mug $5.95 — 2 for $10.95
15 oz. Mug $7.95 — 2 for $14.95
(pairs can have different designs) s/h $1.50 Per Order
Allow 6 wks delivery. NC residents add 5% tax
Send Check Today To: CALL SIGN CUPS
P.O. BOX 17062, Raleigh, NC 27619

CIRCLE 344 ON READER SERVICE CARD

IF YOU BUY, SELL OR COLLECT OLD RADIOS, YOU NEED...
ANTIQUE RADIO CLASSIFIED
Antique Radio's Largest-Circulation Monthly Magazine
Articles - Classifieds - Ads for Parts & Services
Also: Early TV, Ham Equip., Books, Telegraph, 40's & 50's Radios & more...
Free 20-word ad each month. Don't miss out!
Free Sample. 6-Month Trial - $11.
1-Year: $19 ($28 by 1st Class). Foreign - Write.
A.R.C., P.O. Box 2-E4, Carlisle, MA 01741

CIRCLE 271 ON READER SERVICE CARD

NEED QUICK TURNAROUND ON CRYSTALS?

TRY OUR E.O.D.
(EMERGENCY ORDER DEPARTMENT)
AND GET
JAN QUALITY and STABILITY, PLUS LOW PRICES!

JAN CRYSTALS

You benefit from 23 years of manufacturing quality crystals for industry, military services, radio amateurs, citizen band, and experimenters.

FOR FREE CATALOG CALL OR WRITE:
JAN CRYSTALS
P.O. BOX 06017
FORT MYERS, FL 33906
(813) 936-2397
VISA MasterCard

TOLL-FREE: 1-800-237-3063
IN FLORIDA: 1-800-226-XTAL
FAX ORDERS: 1-813-936-3750

CIRCLE 22 ON READER SERVICE CARD

CB-TO-TEN

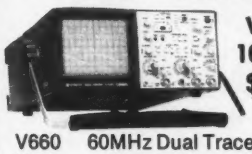
73 has led the way on CB-to-10 meter conversions. Take advantage of our offer to help you get on 10 meters before the sunspots peak again. It's easy and saves you money!

#	Title	Issue
1	Bandplan and Crystal Info	May 77
2	Conversion Data	May 77
3	Radio Shack TRC-47	Jul 77
4	E.F. Johnson Messenger 123A	Jul 77
5	Hy-Gain 670B	Jul 77
6	Antenna Suggestions	Dec 77
7	Radio Shack Realistic TRC-II	Dec 77
8	The Publicom I	Feb 78
9	How about SSB Conversions?	Jul 78
10	Radio Shack TRC-11 and TRC-74	Aug 78
11	Radio Shack Realistic Mini 23	Sep 78
12	Hy-Range 681A (Hy-Gain)	Sep 78
13	Kraco KCB-2310B	Oct 78
14	Lafayette Telsat SSB-75	Nov 78
15	Radio Shack Realistic TRC-452	Nov 78
16	CB Walkie-Talkie Conversion	Nov 78
17	Sharp Model CB-800A	Jan 79
18	SBE Sidebander III and Pace 123A	Jan 79
19	Midland 13-882C and Other PLL Rigs	May 79
20	Lafayette SSB-75 and SSB-100	Jun 79
21	Royce I-655	Nov 79
22	Johnson Viking 352	Nov 79
23	CB to 10 FM - Part I	Jan 80
24	CB to 10 FM - Part II	Feb 80
25	More Talk Power for the TRC-11	Mar 80
26	Sears RoadTalker 40	Mar 80
27	Penney's SSB Rig	Apr 80
28	The Poly-Paks 40-Channel CB Board	Jun 80
29	The Cobra 132	Jul 80
30	New Life for SSB CB Rigs	Jul 80
31	Double Your Channels in SSB Conversions	Jul 80
32	On Ten FM	Aug 80
33	Put That Hy-Gain CB Board to Use	Sep 80
34	Peaking and Tweaking Hy-Gain Boards	Mar 82
35	CB to CW? (Hy-Gain)	Jul 82
36	Maximum Modulation for CB Conversions	Dec 82
37	Beef Up Your CB-to-CW Conversion	Feb 83
38	Add a Digital Readout to Your CB Conversion	Feb 83

Send $3.00 for the first article and $1.50 each thereafter. Just choose the article numbers and call with a credit card number or send a check or money order to: *CB to Ten, 73 Amateur Radio Magazine, WGE Center, Peterborough NH 03458 (603-525-4201).*

HITACHI SCOPES

15-25% Discount



V1060 100MHz $1285

V660 60MHz Dual Trace $949
V422 40MHz Dual Trace $699
V212 20MHz Dual Trace $379

ELENCO PRODUCTS AT DISCOUNT PRICES!

$498
MO-1252

Scopes
MO-1252 35MHz Dual Trace $498
MO-1251 20MHz Dual Trace $349
w/ Two 1x, 10x 100MHz probes, manual
S-3000 10MHz fully calibrated $239
P-2 Scope Probe 100MHz $23.95
P-1 Scope Probe 65MHz $19.95

GF-8016 Function Generator with Freq. Counter

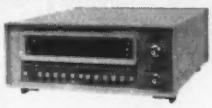
$239.95

Sine, Square, Triangle
Pulse, Ramp, .2 to 2MHz
Frequency .1 thru 10MHz
GF-8015 without Freq. Meter $179

Digital Triple Power Supply
Model XP-765 $239.95

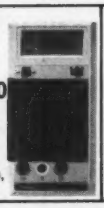
0-20V @ 1A
0-20V @ 1A
5V @ 5A
Fully Regulated, Short Circuit Protected with 2 Limit Cont. 3 Separate Supplies
XP-660 w/ Analog Meters $169.95

Multi-Function Counters F-1000 1.2GHz $259.95



F-100 120MHz $179.95
Frequency, Period, Totalize, Self Check with High-Stabilized Crystal Oven Oscillator, 8 Digit LED Dis

Digital LCR Meter



$138.00
Model LC-1800
Measures Inductors, Capacitors, Resistors

Multimeter with Cap. and Trans. Tester

$55.95
Model CM-1500A
8 Functions with Case

C&S Sales Inc., 1245 Rosewood
Deerfield, IL 60015 (312) 459-9040
800-292-7711 ASK FOR CATALOG
15 Day Money Back Guarantee
2 Year Limited Guarantee
Add 5% for Postage ($10 max)
IL Res., 7% Tax
VISA MasterCard

CIRCLE 356 ON READER SERVICE CARD

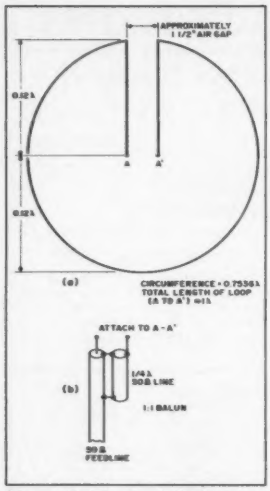


Figure 3. The lambda loop antenna (a), with 1:1 coaxial balun details (b).

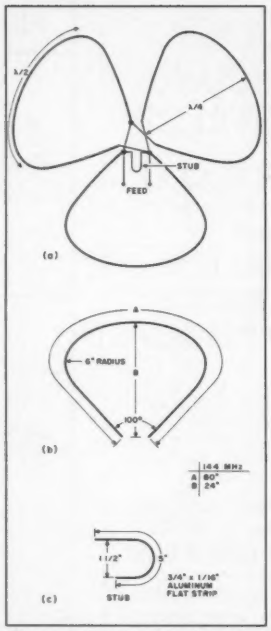


Figure 4. The big wheel antenna (a), with detail of one of the elements (b) and the matching stub (c). Dimensions shown are for the 2m band, but they can be scaled for operation on other frequencies.

should provide a starting place for those who wish to duplicate this antenna.

Two stacked halos increase gain and lower the angle of radiation. A typical spacing distance is ½-wavelength. To achieve a proper match, first match each antenna to the main feedline (assumed to be 50Ω). This lets you feed each antenna via a quarter-wavelength of 75Ω coax. The two lengths of 75Ω line are joined with a "T" to the 50Ω main transmission line.

Lambda Loop

The lambda loop is similar to the halo in that both are dipoles formed into loops. The lambda loop, however, is one-wavelength in circumference, which gives it some gain over a halo. See Figure 3 for the loop schematic. Feedpoint impedance is reportedly about 50Ω (RSGB VHF/UHF Manual), making coaxial feed via a 1:1 balun convenient.

The Big Wheel

This antenna is certainly an attention-getter. W1FVY and W1IJD developed the big wheel years ago. Its name aptly describes it—it consists of 3 one-wavelength elements bent in the manner noted in Figure 4 and connected in parallel. The result, effectively, is that the center portion of each element is a ½-wavelength radiator with a ¼-wavelength feeder. The three elements together are thus three ½-wavelength radiators in phase.

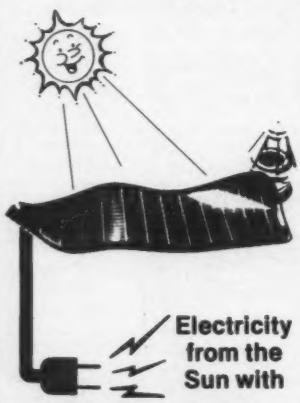
Having a hard time visualizing the antenna despite the schematic? See Photo D to help you. Gain over a halo is 2 to 3 dB, roughly equivalent to stacking two halos. Note the construction details in Figure 4.

"It's easy to get in on the fun of mobile VHF SSB."

For More Info

This month's column should provide you with some ideas on how to make your own horizontally-polarized mobile antenna for the VHF/UHF bands. Given the relatively small dimensions involved and low cost of materials, there's little reason not to try building one of these beauties yourself. For more information on these types of antennas, refer to some of the older editions of the *ARRL Antenna Book* or *VHF Manual*, or the *RSGB VHF/UHF Manual*. Good luck, and see you on SSB! 73

LET THE SUN DO THE WORK



Electricity from the Sun with

SOVONICS™ Solar Systems

- Charge batteries on stored machinery
- Light your tent
- Run fans
- Run remote transmitters
- Light signs
- Pump water for your animals
- Power for your motor home
- Run your radio without batteries
- Light your home
- Yard lights
- Charge flashlight batteries
- Light your cabin
- Run electric fences
- Charge your boat battery
- Run appliances in your home
- Charge hand held radio batteries
- Fish shanty lights
- Charge your Camcorder battery pack

ALSO: *OUTSTANDING* PRICES ON IBM XT COMPATIBLE SYSTEMS!

SHIPPING INFORMATION: PLEASE INCLUDE 10% OF ORDER FOR SHIPPING AND HANDLING CHARGES (MINIMUM $2.50, MAXIMUM $10). CANADIAN ORDERS, ADD $7.50 IN US FUNDS. MICHIGAN RESIDENTS ADD 4% SALES TAX. FOR *FREE* FLYER, SEND 22¢ STAMP OR SASE.

HAL-TRONIX, INC.
12671 Dix-Toledo Hwy
P.O. Box 1101
Southgate, MI 48195

(313) 281-7773
Hours
12:00 - 8:00 EST Mon-Sat

"HAL" HAROLD C. NOWLAND
W8ZXH

CIRCLE 175 ON READER SERVICE CARD

Number 26 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free, on a space-available basis. To make our job easier and to insure your listing is correct, please type or print your request clearly on a full (8 ½ x 11) sheet of paper. Double-space and use upper and lower case letters where appropriate. Also, write numbers carefully—a 1, for example, can be read as an I or an i or a 7 as a 1. Thanks for your cooperation.

Wanted: External Frequency Display YC-7B for the Yaesu FT7B.

Bill Parker W4YKW
3154 Ravenwood Dr.
Falls Church VA 22044

I need service info for the following items and will purchase or pay for the copying costs: Unicom Electronics power supply Model PS-11R, Tandy 64K Color Computer II, Model 26-3127, EMP/GTS Manual Mini Modem Model MM-101 (manufactured by Elec and Eltec Co., Hong Kong), Heathkit Oscilloscope Calibrator Model IG-4505, Leader RF signal generator Model LSG-11, Garrard Turntable Model Lab 95B, Johnson Messenger CB Model 323, Apple IIe Pro System Duo-Disk Imagewriter Printer/Monitor II, and ICOM IC-735 transceiver.

Mike Adams
Haney Vo-Tech Center
3016 Hwy 77
Panama City FL 32405

I am looking for a receiver for the 225–400 MHz AM Military aeronautical band. I know that there are several continuous coverage scanners available, but they are $350 up—do you have something cheaper?

Doug Graham
4929 Elm
Arcadia TX 77517

QTH-DX

QTH is Luxembourg

Leon Fletcher N6HYK
274 Webster Drive
Ben Lomond CA 95005

Where Small is Great

A couple was driving across Europe. He asked, "What country are we coming to?"

She answered, "I don't know, I'll check the map."

He replied, "Don't bother, we just left it."

That chestnut, repeated often by visitors to Luxembourg (LX), is a gag that fits.

At its widest spot, Luxembourg is only 35 miles across, and from north to south, it is just 51 miles long. The speed limit on the country's motorway is 75 miles per hour.

Luxembourg, covering 996 square miles, is smaller than Rhode Island. Yet 23 other independent countries are smaller still.

Luxembourg's population is about one-third of Rhode Island's population of 367,000 inhabitants, or roughly the same as Portland, Oregon or Baton Rouge, Louisiana. Close to one-fourth of the people live in the city of Luxembourg, which has a population of 100,000, nearly the same as Durham, North Carolina or Reno, Nevada.

The complete, official name of the country may be the most regal in the world: The Grand Duchy of Luxembourg. Such dignity is appropriate.

Fairytale castles seem to be everywhere. Seventeen are listed in the nation's official tourist booklet. All of the ancient structures are open to the public. The Grand Ducal Palace, built in 1580 in the city of Luxembourg, is especially notable.

For centuries, that city was one of the strongest fortresses in the world. But between 1867 and 1883, many parts of its ancient defenses were dismantled. Still preserved, however, is the Casemates, a 14-mile network of underground passages dug through solid rock, which tourists can wander through daily from March to October.

Who Will Rule?

Despite Luxembourg's elaborate preparations to defend itself, various European powers ruled it for many years. In 57 B.C., Julius Caesar led his legions through the country. In the fifteenth century, Spain took over the land. In 1717, Austria ruled, and in 1795 France annexed it. Finally, in 1815, the Congress of Vienna granted autonomy to the country. After that, for more than a hundred years, Luxembourg declared a policy of neutrality.

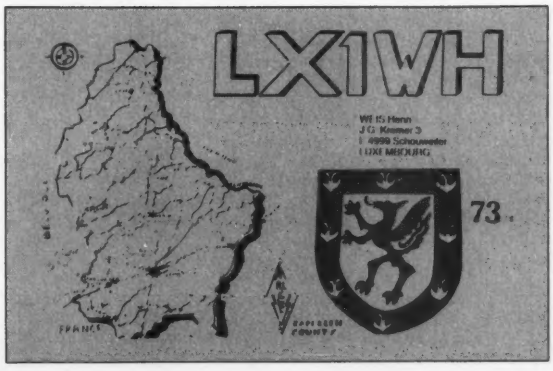
But Germany ignored that position, and overran the tiny land during both World War I and World War II. In WWII, some 60,000 Luxembourg homes were destroyed in what we call "The Battle of the Bulge," and what Europeans call "The Ardennes Offense." 19,000 Americans were killed and 62,000 injured while fighting the Nazi invasion. Luxembourgers remember.

Memorials, museums, and other momentos of those supreme sacrifices dot the entire country. One of the major roads leading out of the capital is named Boulevard General Patton, in honor of the American commander who led the US Third Army. The road leads to the military cemetery of Hamm, some three miles out of Luxembourg, where 5,100 American Soldiers are buried.

One of the graves is that of General George S. Patton, Jr., who died in 1945 in an auto wreck in Germany. The burial site was selected by his widow, who said, "I know George would want to lie beside the men of his Army who have fallen."

Other Luxembourg memorials to Americans who fought there include the Patton Museum in Ettelbruck; a monument in honor of the 6th US Armored Division in Heinerscheid; in Medernach, a monument to the Ninth U.S. Armored Division; and another museum in a stone chateau built in the twelfth century, in the resort town of Clervaux.

But after the tragic experiences of World War II, Luxembourgers decided on a new policy: they renounced neutrality by joining NATO. Still, the nation takes seriously and works hard to follow its motto: *Mir woelle bleiwe wat mir sin,* "We want to remain what we are."



"Memorials, museums, and other momentos of those supreme sacrifices dot the entire country."

Present Day

What they are, according to the *New Book of World Rankings,* is very near to the top of all nations in the world in several key factors. Their literacy rate is the third highest. On a per capita basis, they spend more on education than any but four other countries, rank third in the world in number of passenger cars, and tenth in number of telephones. Their homes are the seventh most spacious in the world. On a per-resident basis, Luxembourgers lead the world in production of beer and of steel.

One steel company, ARBED (Acieries Reunies de Burback-Eich-Dudelange), employs one out of every seven workers in the country. ARBED also provides one-fifth of the nation's gross national product and one-half of its exports.

Luxembourg is a land for linguists. French is the official language, widely used in administration. German is the literary language, used the most for commerce and the press. The everyday spoken language is Luxembourgeois, also called Letzburgesch, a mix of German, French, and Dutch. Nearly everyone also speaks French and German, and many residents speak English. In primary schools, instruction is in German; French is added in secondary schools. At the age of 12, students select between two "sections" of study: technical education or classical; if they select classical, their studies include Latin and English.

There are 369 hams licensed in Luxembourg, one for every 995 residents, close to half as many per capita as in the United States. Licensed stations include four schools, three relay stations, two scout groups, and one each for packet radio, the Police Association International, the Bavarian DX Club, and the Shack (sic) du Reseau Luxembourgeois Mensdorf.

Highlights for visitors include exploring the ramparts which encircle the ancient town of Vianden; watching, perhaps playing, open air chess in Remich; touring the famous rose gardens in Walferdange; sampling the country's 23 major museums; attending the strawberry and apple festivals in Steinsel; observing the international canoe competitions in Kautenback; visiting the shooting grounds in Hesperange and Schifflange; or attending the windsurfing school in Insenborn-Lutzhausen.

Then there's sight-seeing the remains of a Roman camp in Aalburg; cross-country skiing around Perle; touring The Caves Cooperatives, which store three million liters of wine, in Wormeldange; or trying the "very mineralized waters" in Mondorf-les-Bains, which, local publicity claims, are good "for the treatment of complaints of the liver, gall bladder, stomach, and intestines, as well as rheumatism in all its forms."

Despite such variety, or maybe because of it, there are more Luxembourgers, according to *The People's Almanac,* living in Chicago than in Luxembourg City. 73

SPECIAL EVENTS

Ham Doings Around the World

GROVERS MILL NJ
OCT 30–31

The GE Astro Space Division ARC will operate WB2JQR from 1400Z the 30th to 0200Z the 31st from the first Martian landing to commemorate the 50th anniversary of Orsen Wells' Mercury Theatre "War of the Worlds" broadcast. Suggested frequencies: CW—3.535, 7.035, 7.135, 14.035, 21.135, 28.135 MHz and phone—3.950, 7.235, 14.285, 21.355, 28.400 MHz, as operators and conditions allow. For QSL and certificate, send QSL and legal-size (or 9 x 12 for unfolded certificate) envelope to *Alex Montare KA2VLP, Astro Radio Club, MS 410-1B, GE Astro Space Division, PO Box 800, Princeton NJ 08543-0880; 609-426-3564.*

MELROSE MA
NOV 1–20

The Quannapowitt Radio Association of the Boston Northern Suburbs announces its 40th Anniversary QSO Party on the above dates from 0000 UTC to 2400 UTC. Work at least one QRA member on any amateur band, and in *any* mode permitted by the participant's license. QRA members will identify themselves by sending "QRA." To claim the QRA 40th Anniversary Certificate, send your QSL and business-size SASE to *Jim Chetwynd W1UZK, 124 Forest St., Melrose MA 02176.* Claims must be received by February 28, 1989.

HOQUIAM WA
NOV 5–6

The Grays Harbor ARC will operate from the City of Aberdeen Museum of History from 1600Z on the 5th to 2400Z on the 6th, to commemorate the 100th birthday of the city. Look for W7ZA on the lower 25 kHz of the general phone bands, on 15–80 meters, on 28.310 MHz, on the Novice portion of the 10 meter band, and on the first 25 kHz of the general CW bands. For a special QSL card, please send SASE and QSL to *ARS KA7AIR, Joe Ledesma, 516 6th St., Hoquiam WA 98550.*

CONCORD NC
NOV 6

The Cabarrus Amateur Radio Society will hold its 10th annual Hamfest at the New National Guard Armory from 9 AM to 6 PM. Dealer set-up at 6 AM. FCC examinations by pre-registration only. Prizes, forums, auction. Tickets, $3 in advance, $4 at door. Flea market tables, $5 each. Talk-in on 146.055–146.655. *Concord Hamfest, 2015 Applegate Drive, Concord NC 28025.*

AURORA IL
NOV 10

The City of Lights mini-certificate commemorates the 5th anniversary of a Chapter of the Ten-Ten Int. Net, Inc. You may obtain the full-size certificate for $1 plus two stamps. Send your 5-year number to our new C.M. *Earl Henly WB9NYC, 1960 No. Marywood Ave., Aurora IL 60505.*

VICTORIA AUSTRALIA
NOV 12

The Australian Ladies' Amateur Radio Association is holding a 24-hour contest on the above date from 0001 UTC to 2359 UTC. YLs work everyone, OMs work YLs only. 3.5, 7, 14, 21, and 28 MHz bands only (write for more specific information). Phone and CW. Certificates awarded in nine categories, plus the Mrs. Florence McKenzie CW Trophy award. For details, contact *Mrs. Marlene Perry VK3JAW, 218 Ninth St., Mildura. 3500, Victoria AUSTRALIA.*

MILWAUKEE WI
NOV 12

The Milwaukee Repeater Club is sponsoring the 4th annual "6.91 Friendly Fest" from 8 AM to 1 PM at Serb Hall. Sellers admitted at 7 AM. Easy access, swapfest bargains, exams. Tickets, $3, four-foot tables, $4. Talk-in on 146.91 and 146.52. To save $1 per ticket or table, send SASE with payment before November 5 to *The Milwaukee Repeater Club, PO Box 2123, Milwaukee WI 53201.* For information, call *414-444-4589 (24-hr. answering machine).*

HOQUIAM WA
NOV 12–13

The Grays Harbor ARC will operate from the Tall Ship Shipyard at the Grays Harbor Historical Seaport from 1600Z the 12th to 2400Z the 13th, to commemorate the launching of the *Lady Washington*. Look for W7ZA on the lower 25 kHz of the general phone bands on 15–80 meters, on 28.310 MHz, in the Novice portion of the 10 meter band, and the first 25 kHz of the general CW bands. For a special QSL card and fact sheet, please send an SASE (#10 preferred) and QSL to *ARS KA7AIR, Joe Ledesma, 516 6th St., Hoquiam WA 98550.*

NORTH HAVEN CT
NOV 13

The South Central Connecticut ARA is sponsoring its Hamfest and Computer Flea Market in the North Haven Park and Recreation Center on Linsley St. from 9 AM to 3 PM. Admission, $2. Tables, $12 in advance, $15 at door. Talk-in on 146.01/.61. VE exams, commercial exhibits, refreshments. Wheelchair accessible. For information, contact *Brad Oestreicher WA1TAS at 203-265-6478 from 7 to 10 PM.* Or write *SCARA Flea Market, PO Box 81, North Haven CT 06473.*

MELROSE MA
NOV 18

The Quannapowitt Radio Association of the Boston Northern Suburbs is celebrating its 40th Anniversary at 7 PM on the above date. Informal dinner, speakers, door prize, and raffle. The meeting will be in the Wakefield-Lynnfield United Methodist Church in Wakefield. Talk-in on 147.075. The entire radio amateur community, spouses, and guests are welcome. Contact *Jim Chetwynd W1UZK, 124 Forest St., Melrose MA 02176.*

SUMTER SC
NOV 19

The Sumter Amateur Radio Association will sponsor a late fall Hamfest at the SC National Guard Armory on North Pike Road in Sumter. Activities include VE testing (bring photocopy of license), ATV seminar, indoor flea market. Handicap access. Advance tickets, $3. At door, $4. Talk-in on 147.015. Contact *SARA, PO Box 193, Sumter SC 29151-0193.* Or call *George Mudd KK4QZ at 803-773-5053.*

GRANITE CITY IL
NOV 19–20

Starting at 1800Z on the 19th, the Egyptian Radio Club W9AIU will go in search of the great Piasa bird. Work W9AIU or Egyptian Radio Club member for certificate. Suggested frequencies: CW—up 50 kHz from bottom of bands; phone—lower portion of the general 80–15 meter bands; and Novice—28.428 MHz. For certificate, send large SASE to *W9AIU, PO Box 562, Granite City IL 62040.*

MONTGOMERY AL
NOV 19

The Montgomery ARC will host the 11th Annual Central Alabama Hamfest at the Garrett Coliseum. Free admission, free parking, and overnight RV parking with $5/night hook-up. Flea market and dealer set-up at 6 AM. Tables, $7 each. Doors open from 8 AM to 3 PM. Novice through Extra Class FCC exams. Bring a copy of current license for upgrades. Talk-in on 146.24/.84 W4AP/RPT. Other local repeaters on 147.78/.18, 449.50/444.50, and 146.32/.92 with autopatch. Contact *Montgomery Hamfest, PO Box 3141, Montgomery AL 36109.* Or call *Al W4CNQ at 205-272-9130.* For table reservations: *Jiggs K4JZA at 205-365-0380 or Fred K8AJX at 205-263-9557.* For dealer information: *Randy N4LZK at 205-832-4598.*

RALEIGH NC
NOV 19–25

The Raleigh Amateur Radio Society club station W4DW, as W2**0**0DW, will conduct a Constitution Special Event from 0001Z on the 19th to 2359Z on the 25th on all the HF bands. On Friday the 19th, they will operate from the State Capitol. Stations checking in will receive a commemorative card embossed with the state seal and descriptive literature. Your card will be given to the North Carolina Bicentennial Commission to archive and display at the Tercentenary Celebration in 2088. Send #10 SASE to *RARS, PO Box 17124, Raleigh NC 27619.*

MASSILLON OH
NOV 20

The Massillon ARC will sponsor Auctionfest '88 at the Massillon K of C Hall on Cherry Road from 8 AM until 5 PM. Sellers set-up is at 7 AM. Admission is $3.50 in advance, and $4 at the door. Many tables are available at $7 per eight-foot space. Free parking. Auction begins at 11 AM. Talk-in on W8NP 147.78/.18. For information and registration, contact *Massillon ARC, PO Box 73, Massillon OH 44648. SASE please!*

GREENSBORO NC
NOV 26–27

The Mark 4 Radio Club is sponsoring its Hamfest from 9 AM to 5 PM and 9 AM to 3 PM, respectively, at the National Guard Armory. Some features are exams, Christmas craft exhibitors, paved tailgate and flea market area. Advance tickets, $4; at door, $3. Inside tables are $12 each. $2 unlimited flea market space. Talk-in on 145.250 (−0.600) if back on air, 147.030 (+0.600) backup. 146.520 simplex local. For information and registration, contact *Fred Redmon N4GGD, 3109 Goodall Dr., Greensboro NC 27407; 919-852-9244 between 9 PM and 11 PM only.* For tickets, contact *Henry Hughes KA4LPA, 2811 Gwaltney Rd., Greensboro NC 27407; 919-292-0633.* For exams, contact *T.E.A.R.C., Jim Williamson NQ4T, 3504 Stonehurst Place, High Point NC 27260; 919-869-6637.*

PERFORMANCE AND VALUE WITHOUT COMPROMISE

KRP-5000 REPEATER

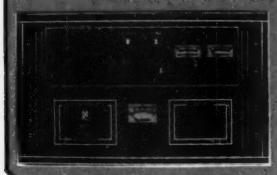
2 METERS-220-440

Word is spreading fast- "Nothing matches the KRP-5000 for total performance and value. Not GE, not even Motorola."

RF performance really counts in tough repeater environments, so the KRP-5000 receiver gives you 7 helical resonators, 12-poles of IF filtering, and a precise Schmitt trigger squelch with automatic threshold switching. The transmitter gives you clean TMOS FET power.

Enjoy high performance operation with remote programmability, sequential tone paging, autopatch, reverse autopatch, 200-number autodial, remote squelch setting, status inputs, control outputs, and field-programmable Morse messages.

Call or write for the full performance story . . . and the super value price!



KRP-5000 Repeater shown with PA-100 Amplifier

Micro Control Specialties
23 Elm Park, Groveland, MA 01834
(508) 372-3442
TELEX: #4932256 KENDECOM
FAX: #5083737504

The first choice in
Transmitters - Receivers
Repeaters
Repeater Controllers
Power Amplifiers
Voice Mail Systems

CIRCLE 295 ON READER SERVICE CARD

NEW! AUTOPATCH WITH REPEATER CONTROLLER

CES 510SA-II FEATURES:

- Simplex sampling for fixed station operation
- Half or full duplex operation for repeater use
- Variable sample window and sample rate in simplex
- Mobile access via single- or multi-digit DTMF codes
- Remotely programmable functions include connect code, activity timers, and toll restrict
- Supplies programmable logic for use as a repeater controller, including XMIT hang time, TOT, CW ID interval, and courtesy beep
- Remote base station operation enabled by special security code
- Reverse patch capable, automatic ring-out upon receipt of an inbound call
- Four selectable CW IDs for repeater or patch time out, patch on, and error message

Regardless of your autopatch requirements, the CES Model 510SA-II will supply reliable, long term service for amateur fixed station or remote repeater sites.

Make The RIGHT Connection

CES Communications Electronics Specialties, Inc.

931 S. Semoran Blvd./Suite 218
Winter Park, FL 32792

Call us now, TOLL FREE 1-800 327-9956

the HAM STATION

P.O. Box 6522
220 N. Fulton Ave.
Evansville, IN 47719-0522

Store Hours
MON-FRI: 9AM - 6PM
SAT: 9AM - 3PM
CENTRAL TIME

SEND A SELF ADDRESSED STAMPED ENVELOPE (SASE) FOR NEW AND USED EQUIPMENT SHEETS

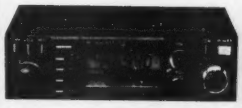
WARRANTY SERVICE CENTER FOR: ICOM, YAESU, TEN-TEC

FOR SERVICE INFORMATION CALL (812) 422-0252
MONDAY - FRIDAY
9:00 AM - 12:00 NOON

TERMS:
Prices Do Not Include Shipping. Price and Availability Subject to Change Without Notice
Most Orders Shipped The Same Day
COD's Welcome

YAESU

FT-747GX
- 100 Watts of Economical Performance
- Dual VFO's, 20 Memories
- Rec eives from 100 kHz-30 MHz
- Built-in CW Filter + More



FT-212 RH
- 2 Meter Mobile
- Optional, Internal Digital Voice Recorder
- RX 138-174 MHz
- TX 144-148 MHz
- 45 Watts Output
- FT-712 RH Available for 70cm

ICOM

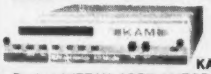
IC-32AT
- New Dual Band HT
- RX-138-174 MHz 440-450 MHz
- TX-140-150 MHz 440-450 MHz
- 5 Watts Output on Both Bands
- Full Duplex & 40 Memories

IC-228A
- 25 Watt, 2 Meter FM Mobile
- RCV 138-174 MHz
- TX 140-150 Mhz
- 20 Memories

TEN-TEC

PARAGON
- Full Featured Synthesized HF Transceiver
- General Coverage Receiver
- 100w Output
- SSB, CW, FSK, Optional FM
- 62 Programmable Memories
- Made In USA

Kantronics



KAM
- Packet, WEFAX, ASCII, AMTOR, RTTY, CW
- Simultaneous Operation on HF and VHF

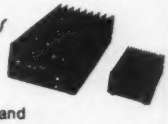
ALINCO

ALD-24T
- Dual Band Mobile 140-149.995 MHz/ 440-450 MHz
- 21 Programmable Memories
- 25 Watts Output on Both Bands
- Loaded with Extra Features

MFJ

MFJ-1278
- Multi-Mode Data Controller
- Packet, RTTY, ASCII, CW, WEFAX, SSTV, Contest Memory Keyer

concepts



VHF/UHF AMPS
- High VSWR and Overdrive Protection
- 5 Year Warranty, 6 Months on RF Transistors
- All Units have GaAsFET Receive Pre-amps

For Orders and Price Checks Call 800-523-7731

Indiana and Information Call 1-812-422-0231

TONNA

CHINCOTEAGUE ISLAND
JUNE 1988
DXPEDITION TO GRID FM23
KC2PX/4

F9FT VHF & UHF ANTENNAS

4	x	17el	144Mhz
		9el	144Mhz (FM)
4	x	5el	50Mhz
2	x	19el	220Mhz
4	x	21el	432Mhz
4	x	23el	903Mhz
4	x	55el	1296Mhz
4	x	24el	2304Mhz

CONTACT YOUR NEAREST DEALER

MOUNTAINTOP COMMUNICATIONS
CAMARILLO, CA (805) 482-2807

HAM ACCESSORIES, WESTMINSTER, MD
(301) 876-8064

KJI ELECTRONICS, CEDAR GROVE, NJ
(201) 239-4389

RF ENTERPRISES, MERRIFIELD, MN
(800) 233-2482

PX

THE PX SHACK INC.
52 STONEWYCK DRIVE
BELLE MEAD, NJ 08502
(201) 874-6013

DEALER INQUIRIES INVITED

CIRCLE 29 ON READER SERVICE CARD

ALL ELECTRONICS CORP.

★QUALITY PARTS CALL OR WRITE FOR A FREE 52 PAGE CATALOG ★DISCOUNT PRICES

WE HAVE OVER 4000 PARTS AVAILABLE!!

FULL WAVE BRIDGE RECTIFIERS
10 AMP 200 P.I.V.
5/8" SQUARE
CAT# FWB-1020
$1.00 each • 10 for $9.00
25 AMP RATING
1 1/8" SQUARE
metal epoxy filled case
200 P.I.V. $2.50 each
CAT# FWB-251
400 P.I.V. $3.00 each
CAT# FWB-254
600 P.I.V. $3.50 each

ITT PUSH BUTTON
ITT MDPL series. 3/4" X 1/2" gray rectangular key cap. S.P.S.T. N.O. Push to close. RATED: 0.1amp switching, 0.25 amp carry current. P.C. mount
CAT# PB-8 65¢ each
10 for $6.00 • 100 for $50.00

10 AMP SOLID STATE RELAYS
ELECTROL# S2181
CONTROL:
Rated 5.5 to 10 Vdc (will operate on 3-32 Vdc)
LOAD:
10 Amp @ 240 Vac
2 1/4" X 1 3/4" X 7/8"
CAT# SSRLY-10B
$9.50 each
10 for $8.50 each
QUANTITY DISCOUNT!
25 for $7.00 each
50 for $6.00 each
100 for $5.00 each

XENON FLASH TUBES
3/4" long X 1/8" diameter
CAT# FLT-1 2 for $1.00

OPTO SENSORS
TRW# OPB815
U shaped opto emitter and sensor unit.
CAT# OSU-3
2 for $1.00
Clairex# CLI800W
U shaped unit with flange mount.
CAT# OSU-2
75¢ each

PHOTO RESISTOR ASSEMBLY
Center-tapped photo resistor mounted in plastic case (can be easily removed). 700 ohms light, 36K dark, 1/4" diameter.
CAT# PR-4 $1.00 each
10 for $8.50

STORES:
LOS ANGELES
905 S. VERMONT AVE.
LOS ANGELES, CA 90006
(213)380-8000

VAN NUYS
6228 SEPULVEDA BLVD.
VAN NUYS, CA 91411
(818)997-1806

MAIL ORDERS TO:
ALL ELECTRONICS
P.O. BOX 567
VAN NUYS, CA
91408
TELEX: TWX-9101010163
ALL ELECTRONICS
FOREIGN CUSTOMERS
SEND $1.00 POSTAGE FOR FREE CATALOG!!

TOLL FREE
800-826-5432
INFO: (818)904-0524
FAX: (818)781-2653
MINIMUM ORDER $10.00
QUANTITIES LIMITED
CALIF. ADD SALES TAX
USA: $5.00 SHIPPING
FOREIGN ORDERS INCLUDE SUFFICIENT SHIPPING.

CIRCLE 194 ON READER SERVICE CARD

AMATEUR TELEVISION

SMILE! YOU'RE ON TV

Only $299

Designed and built in the USA
Value + Quality from over 25years in ATV...W6ORG

With our all in one box TC70-1 70cm ATV Transceiver you can easily transmit and receive live action color and sound video just like broadcast TV. Use any home TV camera or VCR by plugging the composite video and audio into the front VHS 10 pin or rear phono jacks. Add 70cm antenna, coax, 13.8 Vdc and TV set and you are on the air...it's that easy!

TC70-1 has >1 watt p.e.p. with one xtal on 439.25, 434.0 or 426.25 MHz, runs on 12-14 Vdc @ .5A, and hot GaAsfet downconverter tunes whole 420-450 MHz band down to ch3. Shielded cabinet only 7x7x2.5". Transmitters sold only to licensed amateurs, for legal purposes, verified in the latest Callbook or with copy of license sent with order.

Call or write now for our complete ATV catalog including downconverters, transceivers, linear amps, and antennas for the 70, 33, & 23cm bands.

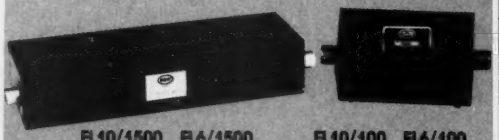
(818) 447-4565 m-f 8am-5:30pm pst. Visa, MC, COD

P.C. ELECTRONICS
2522 Paxson Ln Arcadia CA 91006

Tom (W6ORG)
Maryann (WB6YSS)

T.V.I. problems?

Low pass T.V.I. filters from Barker & Williamson



FL10/1500 FL6/1500 FL10/100 FL6/100

Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
FL10/1500	1000	34 MHz	52 MHz	70 db	1.8 - 30 MHz	$36.95*
FL10/100	100	44 MHz	57 MHz	60 db	1.8 - 30 MHz	$29.50*
FL6/1500	1000	55 MHz	63 MHz	70 db	6 meter	$49.50*
FL6/100	100	55 MHz	63 MHz	50 db	6 meter	$34.50*

All above to match 50 ohm transmitters and antennas.

*Add $2 shipping and handling

ALL OUR PRODUCTS MADE IN USA

BW BARKER & WILLIAMSON
Quality Communication Products Since 1932
At your Distributors. Write or Call
10 Canal Street, Bristol PA 19007
(215) 788-5581

CIRCLE 53 ON READER SERVICE CARD

ATV

Ham Television

Mike Stone WB0QCD
PO Box H
Lowden IA 52255

Great ATV Software

I have compiled a list of personal computer programs that seem ideal as a video input feed to enhance your amateur television studio operations. I include the postage and handling for all prices listed.

EPYX Designer Series (Stock number EP-1550-1) has a neat, complete package program for the Fast Scanner titled Home Video Producer. It retails for $35. A 46-page, easy to read instruction manual and 14 film clips are included. The version I have is for the IBM PC and clone, but EPYX makes the same package for the Apple IIe, IIc, or IIgs and Commodore 64/128 computers. You can pull up all kinds of large letter and picture graphics from menu windows, and create movie effects, such as fades, wipes, corner inserts, time delays, etc., on the film clips.

The Home Video Producer feeds color composite video into a VCR for taping, which gives the ATVer a way to inject the screens he produces into the fast scan transmitter. There are special birthday, wedding, vacation, and sports title sequences. It even has a Hollywood director's clapboard! You can obtain the IBM version directly from *Computer Direct, 22292 N. Pepper Road, Barrington, Illinois 60010.*. For the Apple and Commodore versions, write the software manufacturer: *EPYX, 600 Galveston Drive, Redwood City, California 94063.*

I advise you also to check out StoryBoard. I have heard that it is one of the best IBM computer packages for ATV graphics. Marty Fitzgerald WD0BCE of the Davenport BRATS ATV Group has a version of it, and amazes us all with the neat and dazzling StoryBoard presentations. Write to him and include an SASE for more information.

Then there's Banner for the Radio Shack Color Computer. In this program, jumbo size letters fill your TV screen as they go scrolling by (right to left). They show any one of nine colors, black and white, or in an all-color mode in which each letter is a different color. The Typewriter screen mode lets you type in what you want "live"—good for giving out P-signal reports, etc. A colorful Demo program shows capital and lowercase letters, stops and starts, pauses and varies text speed. There is an on-screen Help section. Breaking into the Test of the demo message shows how to create your own messages. The program is very good and generally easy to use. It's only drawback is that it uses a cassette to save text screen messages. It would be great if it were changed to a disk-save format. Banner is available from *Spec-Com Software, PO Box H, Lowden, Iowa* for $23.

Also from Spec-Com Software, for the CoCo, is a special "ATV Disk Package," #102. This disk is full of dozens of useful ATV graphic programs and utilities, including colorbars, marquees, 3D message generator, and a large CQ Eyeball program, the A5 Symbol IDer, and many others, for $32. Include an SASE for the latest IBM, CoCo, C64 Computer Software Catalog.

For $18, *Griffin Enterprises, PO Box 6104, Sumter, South Carolina 29150;* offers a neat VCR Titler program for the Radio Shack TRS-80 Color Computer. Answer a few questions, and a full screen, excellently designed, large Hollywood clapboard appears with all your information in it! This is great for inserting information about DX openings or special events on your VCR tapes. A large, white-letter, black-background 5-4-3-2 Countdown is also available.

The ATV Bulletin Board is a full color, multi-size, large letter four-way moving, active screen message generator, just like the one you see on your local cable TV channel. Text is programmed easily from BASIC, then loaded into the machine language routine. Put the club's latest messages in the large body text (10 full screens), callsigns of members or authorized users in either of the smaller top or bottom display screens. All screens move independently of each other. Sample BASIC program is included with each order. Price is $42, from *Spec-Com Software.*

Bill Brown WB8ELK of the Findlay, Ohio, ATV Group, just came out with a video ID board design which has up to four custom designed pictures stored in an EPROM. An ad and short article appeared in the May issue of *The USATVS Journal* (page 27). Figures 1 and 2 show examples of the finished screen graphic product depicting the recent W9PRD and WB8ELK Helium Balloon flights. These pictures are in color, of course. Bill and his brother use CoCoMax (another fine program by *Colorware, 78-03 Jamaica Ave., Woodhaven, New York 11421*) and a video camera digitizer to take pictures off VCR tapes, photos, etc., and store them in the EPROM. You can add graphic titles as well. The completed circuit boards are $89. For a catalog of drawings, call or write *Elktronics, 12536 T.R. 77, Findlay, Ohio 45840; (419) 422-8206. Packet via N8ET BBS.*

I know a lot of ATVers have similar programs that are great for the Fast Scan TV mode. How about writing and telling us about them? Tell us (in detail) how they work, what computer they work on, and where to get them. I'll publish these in future columns. Have you ever seen the screen capabilities on an Amiga computer? Check with Jeff KA9TGX in Lafayette, Indiana on this—Wow!

MANY MODES OF ATV

Slow Scan and Facsimile TV Communications

There's a resurgence of good old B & W SSTV activity on 14.230 MHz. It seems when most of the color gang abandoned their

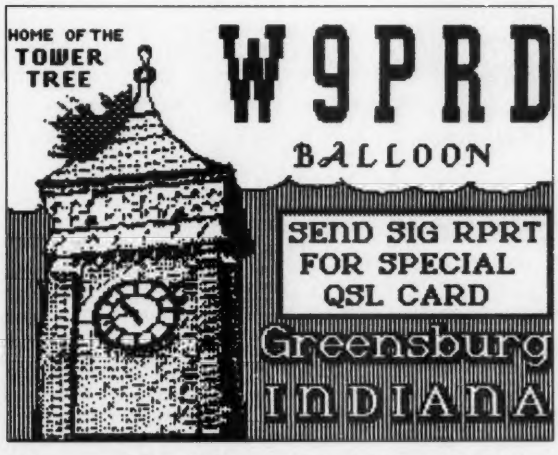


Figure 1. The finished screen graphic depicting the W9PRD Helium-filled Balloon Event. Bill Brown WB8ELK of the Findlay, Ohio, ATV Group designed a 6809 microprocessor board to store the graphics.

KA9WLV
WB8ELK/m
VIDEO I.D. BOARD
•Custom Graphics with your Call Sign
•4 Screens (2 Hi-res/2 color bar)
•12 VDC Operation
•Instant Video ID
•Video Relay for switching in Live Camera Video
•Built-in Automatic Sequencer-Timer (steps through all four screens)
VDG-1 with pre-programmed calls:
$89
Call or write for catalog of available graphics
ELKTRONICS
12536 T.R. 77 • Findlay, OH 45840
(419) 422-8206
ELKTRONICS
12536 T.R. 77
Findlay, OH 45840
KA9WLV-WB8ELK

ASSOCIATED RADIO

8012 CONSER BOX 4327
OVERLAND PARK, KANSAS 66204

VISA—MC
AMEX—DISC.

(EVERY DAY A HAMFEST)

BUY—SELL—TRADE

ALL BRANDS NEW AND RECONDITIONED

WE'LL BUY YOUR EXTRA RIG STATIONS—ESTATES ETC.

Call 913/381-5900

FAX 913/648-3020

SEND $2 FOR CATALOG AND WHOLESALE LIST

QRZ CONTEST!™

VHF Contest Software
for PC Compatibles
$39.95 postage paid

- Covers all VHF and UHF contests
- Includes the 70 MHz European band
- Menu driven and user friendly
- Color and options user configured
- Grids worked display on-line!
- Full dupe checking
- Complete log editor included
- Handles 4000 contacts with 512K
- Demo-version available $5.00
+ HF Version to be available soon!

ATFAB Computers and Electronics

ATFAB Computers and Electronics

P.O. Box 4766
Maineville, OH 45039
(513) 683-2042

VISA MasterCard Accepted

CIRCLE 357 ON READER SERVICE CARD

R-7000 Widespan Panadaptor

Panadaptor especially designed for the R-7000 receiver. For use with a standard scope. Variable span width from 1 to 10 Mhz. Uncover unknown elusive signals. Complete with all cables, & 90 day warranty. $349.95 Shipped. Pa. res. add 6%.

GTI Electronics

RD 1 BOX 272
Lehighton, Pa. 18235
717-386-4032

CIRCLE 326 ON READER SERVICE CARD

NEW! AZIMUTH WEATHER STAR

A Power-Packed Micro Weather Computer for Your Station... by DIGITAR

Complete ONLY $159.95 Plus S&H

PLUS FREE BONUS CALL TODAY!

Reads Wind Speed (MPH/KPH) • Hi Gusts • Wind Direction
Temperature (Present-Hi-Low) • Wind Chill • Scans All!

Protect Your Antenna & Home!

A must in every shack. Now you can scan...heavy Wind Gust...Wind Direction... Temp Hi/Lo and more! Get your own computerized weather station at an incredibly low, affordable price.

The New Azimuth Weather Star by Digitar is a high quality, power-packed weather computer, just loaded with features. Gives you accurate weather data...right in your shack...at the touch of a finger. Created with the latest CMOS micro-chip technology.

You Get All These Exciting **FUNCTIONS & FEATURES** with the TW2...

HANDY, COMPACT SIZE: 2½" × 2½" × 1½"
LARGE, EASY TO READ LCD READOUT Gives you Wind Speed • Records High Wind Gusts • Wind Direction • Wind Chill Factor • Outside Present Temperature (Remote sensor included) • Records High/Low Temperature • Reads in Fahrenheit, Celsius, Miles/Hour, or KM/Hr • Programmable Scan! • Operates on DC (Batteries Not Included) or AC with Optional adaptor.

Your **TW2 SYSTEM COMES COMPLETE WITH** • TW2 Weather Computer • Anemometer & Wind Vane made of high impact, UV resistant plastic, with stainless bearings & shaft for years of trouble free service • 40 Feet of Cable lead-in with connectors • Outside Temperature Sensor • & Mounting Hardware •

And it's **MADE IN AMERICA! YOUR SATISFACTION GUARANTEED!** *Or return in 10 days for a complete refund!*

1 YEAR Limited WARRANTY from Manufacturer!

Your SPECIAL **FREE BONUS** *Order TODAY!*

Get the famous Azimuth World Time, Dual-Zone 24-Hour Station Clock. Displays Local & Intl. in 15 Cities/Zones. ***Retail Value $29.95***

ACT NOW! SEND TODAY!

AVAILABLE OPTIONS:
• Stainless Desk Stand (DSK22) @ $9.95 • Rechargeable Ni-Cad Battery Pack (BP3) @ $7.95 • 40 Ft. Extension Control Cable (EC40) @ 14.95 (Requires 2) • AC Power Adaptor (PS12) @ $9.95 • Please add $3.95 for Shipping & Handling of TW2. For each option add $1.00.

CREDIT CARD ORDERS ONLY
CALL TOLL-FREE 1-800-882-7388 TODAY!
Other Service Call 213-473-1332
(9AM to 6PM PST) Ca. Res. add sales tax.

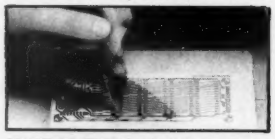
VISA MasterCard

AZIMUTH WEATHER STAR
11845 W. Olympic Bl. Suite 1100, Los Angeles, CA 90064 USA (Dept. A8)

ALSO AVAILABLE AT HENRY RADIO & ALL HAM RADIO OUTLETS!

CIRCLE 158 ON READER SERVICE CARD

MAKE CIRCUIT BOARDS THE NEW, EASY WAY



WITH TEC-200 FILM

JUST 3 EASY STEPS:
- Copy circuit pattern on TEC-200 film using any plain paper copier
- Iron film on to copper clad board
- Peel off film and etch

convenient 8½ × 11 size
With Complete Instructions
SATISFACTION GUARANTEED
5 Sheets for $3.95 10 Sheets only $5.95
add $1.25 postage NY Res. add sales tax

The MEADOWLAKE Corp.
Dept. C, P.O. Box 497
Northport, New York 11768

CIRCLE 55 ON READER SERVICE CARD

ROBOT 400s for the new Color 1200 models, all the inexpensive black and white units quickly got gobbled up for $100 or less.

There is a tremendous supply of discarded ROBOT 400 circuit boards around the country. Enterprising SSTV wizards should buy up these boards for $25 each and make stand-alone home-brew units! What's in a power supply, anyway? Tune into the Saturday afternoon SSTV Net, still on the 14.230 MHz calling frequency with Don Miller W9NTP and Brooks Kendall W1JKF.

I hear that AEA is working on a stand-alone SSTV converter at a very moderate price. If that great company gets involved, Slow Scan might just come alive again and take over the low resolution marketplace. There's the Fred Sharps (W8ASF in Cleveland) and the Tom Hibbens (KB9MC in Desoto, Wisconsin), who keep adding switches and mods to their 400s, never letting them die. It's all for the fun of it, and that's what it's all about!

Facsimile interest still steadily grows. It's a lot of fun to watch incoming FAX pictures, or to send FAX pictures over ATV! Want to get on FAX cheap? Get a TRS-80 Color Computer, a disk or cassette, and the Martin Goodman WEFAX program, and you're in business! However, some of the established FAX boys are concerned that these computerized, low resolution 2–4 gray level pictures might detract from and degrade "real" FAX visual communications. While I sympathize with them, I welcome the new spirit and interest of those getting into FAX with home computers, even at low resolution levels. Once they are hooked, and someone sends them a high resolution facsimile photo in the mail, most will get further in debt by purchasing more sophisticated receiving equipment. Then the real fun begins!

By the way, Greg Mengell now edits *The Journal of the Environmental Satellite Amateur User's Group*.

"There's a resurgence of good old B & W SSTV activity on 14.230 MHz."

Packet ATV

Packet radio has a place on the ATV mode as well. Our ATV Group sponsors a highly elevated, high power Packet digipeater running Kanterm Software on a Commodore 64 computer. The video from the Commodore is fed into one of our twenty TV screens in our remote transmitter Mode-A. We get a kick out of "watching" our own signals enter the system as well as being able to "see" what the digi is hearing! Forty column print is good enough to view all the text thirty to forty miles away on a P3-4 picture. Those wishing to experiment with this should use white letters on a dark background.

ATV Helps OSCAR

This idea helps those hams who enjoy both ATV and HF DXing, but who don't have a personal computer. There are many satellite tracking programs available; AMSAT put out a number of excellent ones. Some have text readouts only and some have video displays of world maps showing where the bird is now located. Get one that shows the video display of the world map—these are best for ATV. Host one of your remote transmitter TV screen windows to this function with a dedicated computer and keep the inputs up to date. You will immediately see interest in satellites increase as the ATV group begins to see this screen and ask the usual questions. How neat for OSCAR trackers and users to be able to go to an ATV screen, see immediately where the bird is, and then go work on it! The same goes for DX groups on MINIMUF and Grayline projections. You got the ATV system up and running—now find ways to make it entertaining and useful for everyone!

We should have the scores from the August USATVS North American FSTV Contest in our next issue. You did enter and give the gang some points, didn't you? 73

THE SMILEY ANTENNA CO.

THE HAND TUNED PERFORMANCE SYSTEM

FEATURING PORTABLE RADIO SIMULATION TUNING

THE TUNED ANTENNA

"Quality through Technology"

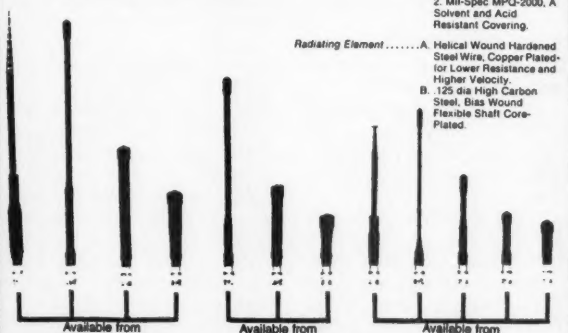
Electrical

Maximum Power .....50 Watts.
Frequency Range .....118-932 MHz.
Impedance.....Matched to the Portable Specialized Tuning Available.

Mechanical

Coating Material .....A. Dipped in Synthetic Rubber to Seal and Webb Coil, Preventing Distortion
B. 1. PVC Covering.
2. Mil-Spec MPQ-2000, A Solvent and Acid Resistant Covering.

Radiating Element .....A. Helical Wound Hardened Steel Wire, Copper Plated-for Lower Resistance and Higher Velocity.
B. .125 dia High Carbon Steel, Bias Wound Flexible Shaft Core-Plated.



FOR DEALER LOCATION CALL 619 579-8916

SMILEY ANTENNA CO., INC. 408 LA CRESTA HEIGHTS ROAD EL CAJON, CA 92021

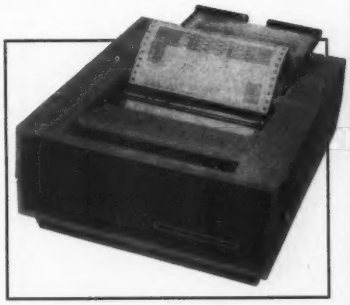
CIRCLE 274 ON READER SERVICE CARD

INDUSTRIAL PRINTER SALE

IDEAL FOR INVOICING, BUSINESS FORMS, PACKET RADIO, TELETYPE, OR ANY HEAVY PRINTING APPLICATION. WHY USE A GOOD LETTER QUALITY DOT MATRIX OR DAISY WHEEL FOR PRINTING INVOICES AND FORMS, MONITORING PACKET & RTTY WHEN A HEAVY DUTY DOT MATRIX PRINTER IS ALL THAT IS NECESSARY?

VICTOR 5080

- MADE FOR CONTINUOUS DUTY
- 4 INTERFACES STANDARD: PARALLEL, RS-232, TTY, IEEE-488
- BI-DIRECTIONAL
- 80 COLUMN—100 CPS
- FANFOLD OR ROLL PAPER
- RE-INKABLE RIBBON
- HANDLES 6 PART FORMS
- COMMERCIALLY SOLD AT $1195.00



NEW & FACTORY SEALED **$109.00**

FOR MORE INFORMATION, OR TO ORDER, PLEASE CALL:

HORIZON MANUFACTURING

▪ 690 GREENLEAF AVE., ELK GROVE, IL 60007 ▪

PHONE: **312-439-1234** FAX: **312-439—3799**

ALL ORDERS SHIPPED BY UPS

IL AND TX RESIDENTS INCLUDE APPLICABLE SALES TAX

CIRCLE 308 ON READER SERVICE CARD

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Ave.
Saugus CA 91350

[Ed. Note: This month we present a special article dealing with the methods that will be used to reverse the FCC order that reallocates the lower 40% of the 1¼ meter band to land mobile use. It is authored by 220 Notes editor Art Reis K9XI—one of the nation's leading authorities on the subject of the 1¼ meter reallocation debacle. . . de WA6ITF]

How To Oppose Docket 87-14

The Department of the Office of Engineering and Technology (OET) of the FCC thinks it has decided the ultimate fate of the 220–222 MHz band (which it has not), it is our turn to go onto the offensive in this battle. There are actions we can take to turn the outcome to our advantage, but there are also those best left to the proper people.

The most important thing we should *not* do is to file any lawsuits on this matter in any court. This is the one time that not only do we have to trust the ARRL, but that we can. There is a time and a place for everything, and in this instance the place is with the League's General Counsel, Chris Imlay N3AKD. The time is whenever Counselor Imlay knows that it is time to file.

What Not To Do

Here are two things you should know. First, the ARRL's Washington attorney is very good. He is a young, aggressive, communications law specialist. He knows the Washington DC courts better than you or me. Nobody practicing general law can match his expertise.

Second, the League Board of Directors has decided to do what it has to do to deal with this situation in the best possible manner. Those of us who are in a position to know the facts, understand the strategy involved. It has an excellent chance of working as long as others don't interfere with the game plan. The quickest way to destroy our counteroffensive against the FCC is to have the wrong folks file suit against them. Let the League do it, and at the proper time.

What Joe Ham Can Do

Once the League has filed suit, anyone can intervene on its behalf. If you or your organization wishes to present facts you feel are germane to the suit, start working now to get them ready for filing. If you give yourself or your group time to do your homework, you will be prepared to present your arguments at the appropriate time, and you will have done your part to help in the war to keep 220–222 MHz all amateur. To the courts, that is all you can do! But isn't that enough?

Write Your Congressmen and Legislators

We can't seem to do enough to hammer home the importance of writing to your senators and representatives to mobilize their support against the FCC. Even at this late date, your letter to Congress counts! Make sure to target it to that staff person who has the FCC as part of his or her assignment. If you do not hear from your elected representatives (and, shockingly, a number of them do not answer their mail!) write'em again and again. It's a great way to show we indeed act in earnest. Remind them of the upcoming election and the considerable voting block the 400,000+ number of US hams represent. Remember—we support these people to represent the interests of the people—you and me!

Urge your congressmen to support Concurrent Resolutions 127 (Senate) and 317 (House). These resolutions express the Sense of the Congress on the issue of amateur radio frequency allocations. *Remember that the FCC, in their action on General Docket 87-14, just slapped in the face the very Congress which appropriates their money for them.* The FCC's action flies in the face of House Resolution 317 and Senate resolution 127, issued in June and July 1988, which specifically state that the FCC should leave amateur radio frequencies alone. If your senators and representatives have not become co-sponsers of these resolutions, write them, urging them to get on the stick and do it.

The following four, key legislators need to hear from *you*:

U.S. House of Representatives:

Rep. John D. Dingell (D-MI), Room 2221 Rayburn HOB, Washington, D.C. 20515. Tel: (202) 225-4071. Attn: John Orlando.

Rep. Edward J. Markey (D-MA), Chairman of Telecommunications and Finance Subcommittee, Room 316 House Annex II, Washington, D.C. 20515. Tel. (202) 226-2424. Attn: Gerry Salemme.

U.S. Senate: *Sen. Ernest F. Hollings (D-SC), Chairman of Commerce, Science and Transportation, Room SD-508, Washington, D.C. 20510. Tel: (202) 224-0427. Attn: Ralph B. Everett.*

Sen. Daniel K. Inouye (D-HI), Chairman of Communications Subcommittee, Room SH-227, Washington, D.C. 20510. Tel. (202) 224-9340. Attn: Tom Cohen.

Investigating the OET

As many hams have been advocating for quite some time, we need at least two investigations of the Office of Engineering and Technology: one by Congress, and one by the Justice Department.

The best way to get the ball rolling is to start an outside investigation. The trouble is to find an investigator with enough credibility to ensure a follow-up. The ARRL is not a good choice since that kind of action might jeopardize their tax-exempt status. Another organization within the hobby, such as a major magazine, would be much better suited for this.

Colonize the 220–225 MHz Band

Finally, the last thing you can do is to colonize all of the band from 220–225 MHz. Why do that, in the face of the FCC's news release urging us to vacate the 220–222 MHz portion? Because this fight is far from over!

The more use we make of ALL the band, the harder it will be for the FCC to justify taking it away from us in court. If you have plans for packet backboning, weak signal work, linking, or for remote bases on 220–222 MHz, make these plans a reality now. Encourage your ham friends to do the same.

The FCC, for all its lip service, has shown no respect for our service, either in this matter, or in the rewrites of Parts 97 and 15. By using the band right up to the last day, instead of turning tail and running, we will give them something to think about for any possible future actions which they may take against us. This fight they have started will take years to finish. Time is on our side!

. . . de K9XI

"Save 220" NTRN

A few years ago, teleconferencing together a few hundred repeaters to talk over important ham radio situations was a common occurrence. Rich, and Lou Appel K0IUQ spent many evenings bringing amateurs throughout the United States and Canada some of the most interesting, informative and entertaining sessions ever to hit the hambands. When Rich left, however, the net slowly disappeared.

If all goes as planned, on Sunday evening, October 2nd, the first NTRN in several years will have taken place. The "Save 220 And All of Our Hambands Teleconference Radio Net," will have had a list of experts on the panel, including co-host Joe Schroeder W9JUV of *Ham Radio Magazine*, ARRL Counsel Christopher D. Imlay N3AKD, noted weak-signal communications expert Rojer Cox WB0DGF, 220 MHz Spectrum Management Association President Karl Pagel N6BVU, Rusty Landis KA0HPK of the Indiana based VHF/UHF Information Exchange, plus a series of experts representing EME and packet radio interests. Back-up distribution for this conference was slated to be over the AMSAT OSCAR 13 satellite if it's within radio range.

Look for announcements here of future NTRNs and participate!

. . . de WA6ITF

Number 31 on your Feedback card

BARTER 'N' BUY

QSLs TO ORDER. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DX-CC Honor Roll Certificate 2–4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

QSL CARDS- Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept A, 310 Commercial, Emporia KS 66801. BNB434

COMMODORE/AMIGA CHIPS Authorized Distributor for the lowest prices of Commodore replacement chips in the country (e.g., 6510–$11.55, 6526–$12.50, 6567–$14.95, 028100/PLA–$13.25)... COMMODORE REPAIRS. Low cost, fast turnaround, $49.95 plus UPS... "THE COMMODORE DIAGNOSTICIAN." An invaluable double sided, laminated guide for fixing your C64/1541 drive. It diagnoses 72 variables and tells you which chips are faulty; $7.95...VISA/MC...Kasara Microsystems, Inc., 24 West Street, Spring Valley, NY 10977. Call toll free 1-800-248-2983 or 914-362-3131. BNB529

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. LEARN MORSE CODE IN 1 HOUR. Amazing new supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, Dept 73-8, 2535 Marietta, Palmbay, FL 32905. BNB531

SB-220 OWNERS!—Enhance performance—add new features. 14 step-by-step mods which include: tuned-input 6- and 160-meter operation, heavy-duty power supply mods, full QSK operation, solid-state bias control, and many more. Source of parts included. One time 50% rebate for new mods submitted and two free updates. 10 pages of tech info on the 3-500Z. Order today—$10 per copy plus $1 postage. SASE for info. Bob Kozlarek WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

WRITTEN EXAMS SUPEREASY. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $5 each. Advanced, Extra: $10 each. Moneyback guarantee. Bahr, Dept 73-8, 2535 Marietta, Palmbay, FL 32905. BNB624

COMMUNICATIONS BATTERIES NiCd Packs/Inserts/Rebuilding. Exact Replacement Packs: Yaesu FNB2 / Wilson BP4 $22.95, Santec 142/1200(3 pin) $23.95, Motorola: HT220-Slim $29.95, HT220-Omni $34.95. Battery Inserts: Icom: BP2/Rap $18.95, BP3/CM3 $16.95, BP5/Rap $24.95, BP7/BP8/Rap $29.95, Kenwood: PB21 $13.95, PB24 $21.95, PB25/25H/26 $25.95, Azden: 300 $21.95, Standard BP1/C118 / Pace MX-BT2 $25.95, Tempo S1/270 $23.95, S1,2,4,5,/450 $23.95, S15 $24.95, Yaesu: FNB3/3A $32.95, FNB4/4A $33.95, TenTec 2991 $24.95, Santec: KTBP $16.95, KTBP2 $23.95, KTBPH $24.95, Rebuilding: Icom/Ken/Yaesu/T-T add $4.00 to insert prices. Others available. S.A.S.E./free catalog. In PA add 6%. For MC and VISA, add $2/order. Add $3 Shipping/order. 814-623-7000; CUNARD ASSOCIATES, Dept. 7, R.D.6 Box 104, Bedford PA 15522. BNB628

ROSS $$$$$$ NEW November SPECIALS: KENWOOD TW-4100A $469.90, TS-440S/WAT $1164.90, TH-215A $318.90, TH-315A $299.99, TL-922A $1359.90. ROBOT 1200 $1159.90, HAL PCI-2000 $479.99, AEA PK-64A/HFM $209.90. ICOM IC-735 $929.90, IC-45A $289.99, IC-28AW/HM14 $424.50, IC-27A $334.99, IC-781 $5539.90. YAESU FP-757GX $199.90, FT-727R $344.90, FT-747GX $729.90. All L.T.O. (Limited Time Offer) LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE. Over 8780 ham-related items in stock for immediate shipment. *Mention ad.* Prices cash, F.O.B. PRESTON. WE CLOSE AT 2:00 SATURDAYS & MONDAYS. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, (P.O. Box 234H), PRESTON ID 83263. 208-852-0830. BNB654

CHASSIS AND CABINET KITS SASE; K3IWK, 5120 Harmony Grove Road, Dover PA 17315. BNB698

CALL SIGN BADGES: Custom license plate holders. Personal, distinctive. Club discounts. SASE. WB3GND, Box 750, Clinton MD 20735. 301-248-7302. BNB699

ROSS $$$$$$ USED November SPECIALS: KENWOOD TM-401A $289.90, TR-9500 $459.90, TR-2400 $169.90, TR-3600A/TU35B $279.90, TS-520SE $449.90. E.T.O. 76 $1299.90, 76PA $1999.90. ICOM IC-215 $99.90, IC-22SW/VIP $149.90, IC-730 $499.90. SWAN ASTRO 102BX $459.90. DRAKE P-75 $69.90, PS-75 $129.90. LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE, WE HAVE OVER 315 USED ITEMS in stock. *MENTION AD.* PRICES CASH, FOB PRESTON. WE CLOSE AT 2:00 SATURDAYS & MONDAYS. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, P.O. BOX 234H, PRESTON ID 83263; 208-852-0830. BNB709

DIGITAL AUTOMATIC DISPLAYS All radios. GRAND SYSTEMS, POB 3377, Dep't A, Blaine, Washington 98230. BNB728

DIGICOM>64: C64 PACKET See AUG 88 *73 Magazine* (by W2UP) for circuit and software details, or write us for more info. Order #154-KIT for kit with disc at $49.95 or #154-ASY for assembled board and disc at $79.95. Add $2.50 S&H per order. A & A Engineering, 2521 W. La Palma, #K, Anaheim, CA 92801; 714-952-2114. BNB732

HAM TRADER YELLOW SHEETS. In our 27th year. Buy, Swap, Sell ham radio gear. Published twice a month. Ads quickly circulate–no long wait for results. Send #10 SASE for sample copy. $13 for one year (24 issues). P.O.B. 2057, Glen Ellyn, IL 60138-2057. BNB741

$$$$$ SUPER SAVINGS $$$$$ on electronic parts, components, supplies, and computer accessories. Free 40-page catalog for Self Addressed & Stamped Envelope. Get on our mailing list. BCD ELECTRO, P.O. Box 830119, Richardson TX 75083 or call 214-343-1770. BNB749

HAM RADIO REPAIR, all makes, models. Experienced reliable service Robert Hall Electronics, Box 280363, San Francisco, CA 94128-0363; 408-729-8200. BNB751

HAM HOLIDAY in VP5. Join cycle 22 fun from rare DX QTH Turks & Caicos Islands. We supply transceivers, antenna, process license and offer accomodations as low as 7 nights $390 each double occupancy in private bungalow. Direct Pan Am service, 80 minutes Miami. Details VP5D, P.O. Box 100858, Ft. Lauderdale FL 33310. BNB760

WANTED: Ham Equipment and other property. The radio club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of ham radio to further and enhance the education of young people. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. We sponsor the "Classroom Net" on 7.238 at 1100 UTC daily and encourage your QSL for our weekly award. Please write us at: P.O.B. 1052, New York NY 10002, or call our round-the-clock hotline: (516) 674-4072. Thanks! BNB762

COMPUTER CODE COURSE. Apple II +/c/e/GS. C-64/128. 37 Modes, Graphics, 1–100 WPM, menus, proportional spacing, variable frequency, more ($29.95). With wordprocessor ($39.95). Manual ($10). Check/MO. LARESCO, POB 2018-ST, Calumet City IL 60409. 1-312-891-3279. BNB764

VHF TO MICROWAVE: GaAsFETS, MMIC'S, transistors erc. SASE; WA31AC, 7148 Montague St., Philadelphia, PA 19135. BNB771

HAM PLAQUES Your callsign custom routed and finished in cedar, approx. 4 x 12. Perfect for wall or desk. Money back guarantee. $14.95 ea. plus $2.50 postage. (In WI add 5%). Send chack and QSL to: Country Carver, P.O. Box 18727, Milwaukee, WI 53218. BNB772

CALL LETTERS Attractive Magnetic Call Letter Strip for your car in lieu of expensive license plates. White on black with letters approx. 1 inch high. Send $9 + $1 shipping and handling with your call and address to Bob Johnson, P.O. Box 14305, Columbus, OH 43214. BNB773

HAMLOG COMPUTER PROGRAM Full features. 17 modules. Auto-logs, 7-band WAS/DXCC. Apple $19.95. IBM, CP/M, KAYPRO, TANDY, CR8 $24.95. 73-KA1AWH, PB 2015, Peabody, MA 01960. BNB775

WANTED: Stancor 10-P Transmitter. Robert Kurth MD. W5IRP, 403 Mantooth, Lufkin TX 75901. BNB780

Barter 'N' Buy advertising must pertain to ham radio products or services.
☐ **Individual (noncommercial)** ..... **25¢ per word**
☐ **Commercial** ..... **60¢ per word**
Prepayment required. *Count only the words in the text. Your address is free. 73* cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary corrections in the next available issue. Please print clearly or type (double-spaced).

No discounts or commissions are available. Copy must be received in Peterborough by the first of the second month preceding the cover date. Make checks payable to *73* Magazine and send to: Rebecca Niemela, **Barter 'N' Buy, *73* Magazine, WGE Center, Peterborough NH 03458.**

SCARA INDOOR HAM RADIO AND COMPUTER FLEA MARKET Sunday, November 13, 1988 at the North Haven Park and Recreation Center, 7 Linsley St., North Haven, CT. Sellers admitted at 7 AM, Buyers from 9 AM to 3PM. Tables are $12 in advance, $15 at the door. general admission $3 per person. Talk-in on 146.01/.61. Reservations for tables must be received with check by November 2, 1988, and NO reservations by phone. For information or reservations, SASE to: SCARA Fleamarket, PO Box 81, North Haven, CT 06473 or call between 7 PM and 10 PM Bard at 203-265-6478. BNB783

DIGITAL FILTER DESIGN PROGRAM for OPTIMAL FIR filters of 3 to 128 stages. PC/Clones. Lists coefficients, plus list and plot of frequency response. With manual, $45. SASE for details. Paul Selwa NB9K, 61 E. Tilden Dr., Brownsburg, IN 46112. BNB784

WANTED: old and unique bugs, such as Vibroplex Zephyrs, Dow Keys, and McElroy bugs. Smiley White POB 5150, Fredericksburg VA 22403. WB4EDB. BNB785

KITS*PARTS*PLANS We have hard to find parts! Variable Tuning Capacitors, Tuning Coils, Crystal and Magnetic Headphones, Germanium Diodes, Crystal and Shortwave Radio Kits. Yeary Communications, 12922 Harbor #800-B, Garden Grove, CA 92640. BNB786

ATTENTION COCO/PACKET USERS: *CoCo Clipboard Magazine* is the only CoCo magazine with a regular column featuring Amateur Radio and the Color Computer. Plus each issue is packed with practical and business applications. $15 for 6 issues (1 year). Sample copy (mailed 1st class) just $3.75. Check or money order to: *CoCo Clipboard Magazine*, Dept. 73, 3742 U.S. 20, Box 3, Fredonia, NY 14063. BNB789

WANTED: Sunair GCU-910A or GCU-935 Antenna Coupler. Ray Dunham, 1030 Hillside Ave., Pacific Grove CA 93950. BNB790

QSLs: Quality at a reasonable price! Satisfaction Guaranteed. Send $1 for samples and coupon worth $2. The Sugarloaf Print Shop, PO Box 563, Sugarloaf, PA 18249. BNB791

ELECTRON TUBES: All types & sizes. Transmitting Receiving, Microwave...Large inventory = same day shipping. Ask about our 3-500Z special. Daily Electronics, PO Box 5029 Compton, CA 90224. 800-346-6667. BNB792

QUALITY HAM "SHAREWARE" SOFTWARE for the IBM-PC and compatibles. Many disks for all aspects of ham radio. Business SASE for catalog. JK&S, Dept. S, P.O. Box 50521, Indianapolis, IN 46250-0521. BNB793

KENWOOD 430s OWNERS! Stop Scan stops the scanner on busy frequencies resumes scanning automatically after an adjustable 1–10 second delay. SASE for 1989 catalog. $19.95 kit. $29.95 assembled. $3.50 shipping. JABCO ELECTRONICS, R1 Box 386, Alexandria, IN 46001. BNB794

VOICEGATE communications noise reduction with audio squelch, noise reduction, VOX cassette recorder control, 3 adjustable audio filters, & more! SASE for 1989 catalog. $3.50 for demo tape. $109.95 complete (till 1/1/89). JABCO ELECTRONICS, R1 Box 386, Alexandria, IN 46001. BNB795

LEARN CODE using your IBM PC or compatible (256kB RAM). Easy to follow menu-driven program on DS/DD floppy disk fully prepares you to copy 5 WPM for Novice license to 50 WPM, exceeding all license requirements.

Features include adjustable *intra/inter*character timing with 1 WPM to 50 WPM sending rate, keyboard-selected character generation and randomly generated letters, numerals, all FCC required punctuation/signals and mixed character types. $11.00 including shipping. *LOGICON*, PO Box 426, Lexington Park MD 20653. BNB796

WANTED: Dead Tempo 2020 for parts. Dan Giles VE7QM, RR3 Harrison Ave., C-6, Ganges, BC, V0S-1E0. BNB797

R-390A RECEIVER PARTS: CPRC-26 military Manpack Radio, 6 meter FM, with antenna, crystal, handset: $22.50, $42.50 pair. Military-spec TS-352 Voltohm/Multimeter, leads, manual: $12.50. $4.50/piece shipping, $9 maximum. Info SASE: Baytronics, PO Box 591, Sandusky OH 44870. BNB798

HAM RADIO PROJECTS. Most under $5.00. Receivers, Xmtrs, Ants, Test Quip., etc. SASE gets list. Ham Projects, 3037 Audrey Dr., Gastonia NC. 28054 BNB799

STATION LOGBOOK - DX INFO in a single IBM/clone program. Allows full logging operations with on-line access to beam headings and country information for over 450 countries. User customizable. 5-¼" disk $20. 3-½" disk $25. Info SASE. - LEB ENTERPRISES, KI6LO, 933 FORREST KNOLL #A18, RIDGECREST CA 93555. BNB800

WANTED— Active filter, Autek Model QF-1A. Also wanted—Manual for transistor version of USN O-scope, Model OS-8E/U, 3-inch CRT. Hank Middendorf, 3930 Eiler, St. Louis MO 63116. Phone 314-481-4609. I'll pay shipping & Ins. BNB801

MACINTOSH Ham Software. MacTrak™ tracks satellites, sun, moon. Graphic or tabular outputs. Compatible with Mirage Tracking Interface for rotor control, $49.95. DX Helper™ provides DX info including distance, bearing, sunrise, sunset, propagation MUF, great circle display, more, $24.95. SASE for info from R. Stegemeyer, P.O. Box 1590, Port Orchard WA 98366. BNB802

WANTED: Yaesu FT101E: Trade for Ariston RD110 turntable? New, paid $1600.00 plus cash. Mike, PO Box 441, C'ville IL 60110. BNB803

WEST COAST SWAP SHEETS, only $12 for 24 biweekly issues. Free ad with subscription. Low advertising rates. WCSS, P.O. Box 1553, Bend OR 97709-1553. BNB804

HOME-BREW PROJECTS LIST SASE to WB2EUF, Box 708, East Hampton NY 11937. BNB805

WANTED: TS-120. Jan Buckowski, PO Box 2852, Petaluma CA 94953-2852. BNB806

QSLs & RUBBER STAMPS—TOP QUALITY! States, World Maps, USA, Key, Shuttle, Globe QSLs. Report Form Rubber Stamps. More! Samples, $1.00 [Refundable With Order]. Ebbert Graphics D-7, Box 70, Westerville OH 43081. BNB807

Number 34 on your Feedback card

LETTERS

From the Hamshack

No-Coder

After having read your editorial in the March 1988 issue of *73*, I felt I had to write concerning the "no code" amateur license.

I have supported the concept of such a license since it was broached to the FCC and received such publicity in the amateur world.

I am extremely interested in our hobby and spend as much of my precious spare time with it as I can. There is no doubt in my mind that we need to encourage our nation's youngsters to join our hobby and enjoy all of its benefits.

I have been teaching amateur radio classes for Novice through Advanced for more than six years.

Though electronics may interest some students, amateur radio is *not* the drawing card. Though the classes do have all ages from 12 to 75, including women, the interest is communications. The modes and methods are far away from CW. The students are exceedingly interested in all theoretical aspects, as well as the practical areas about which we teach. With the availability of all the digital aspects of amateur radio from RTTY to Packet including satellites, CW sits far back in the modes of interest.

I am firmly and strongly in favor of a license without the requirement of learning Morse Code, but stressing theory and practical usage. We will attract a large number of superb hams and it will give the hobby a great boost. Like learning about all of the other areas, or using any of them, a ham can learn and use CW if he so desires. Why must he be forced to?

I certainly would like to see a new no-code proposal receive a favorable ruling.

Edward N. Ludin, MD K2IK
Cherry Hill, NJ

More No-Code

The August edition of *73* came today, the first edition of any radio magazine I subscribe to that has arrived, and I subscribe to them all.

You probably don't remember me. I have jousted with you a couple of time in the past, on whether CW should remain a requirement of ham licensing and a bit about being behind in product reviews (refering to the Ten-Tec Paragon).

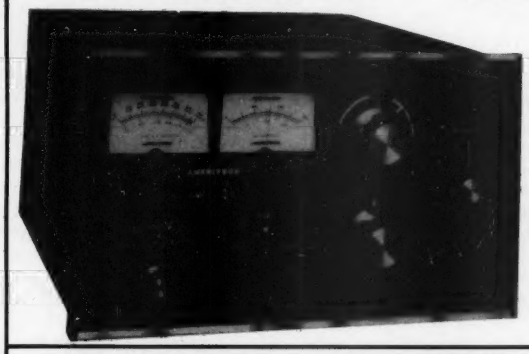
Well, you made up for all your past mistakes with the product review of the Radio Shack PRO-2004 Scanner in your August issue. I have often wanted to modify my PRO-2004 so that it could scan the parts of the 800 MHz band that were removed. The review of the scanner in the August issue includes sufficient information to enable me to do just that (at my own risk, as you said, hi.)

This assistance will insure that I will continue to be a *73* subscriber for may years to come. The views on CW continue to be misguided, though many other ideas pronounced in "Never Say Die" are on the mark. Thanks for having the guts to publish "The Hidden Secrets of the PRO-2004."

William B. Levin NJ7G
Colonel US Army (Ret)
Tacoma, WA

AMERITRON

SYMBOL OF ENGINEERING INTEGRITY. . .QUALITY WORKMANSHIP. . .RELIABLE LONG-LIFE PERFORMANCE



AL-80A LINEAR AMPLIFIER

The AL-80A will provide a signal output that is within 1/2 "S" unit of the signal output of the most expensive amplifier on the market—and at much lower cost.

The Ameritron AL-80A combines the economical 3-500Z with a heavy duty tank circuit to achieve nearly 70% efficiency from 160 to 15 meters. It has wide frequency coverage for MARS and other authorized services. Typical drive is 85 watts to give over 1000 watts PEP SSB and 850 watts CW RF output. A new Pi-L output circuit for 80 and 160 gives full band coverage and exceptionally smooth tuning.

Size: 15½"D. x 14"W. x 8"H. Wgt. 52 lbs.

AL-1200 LINEAR AMPLIFIER

WITH EIMAC 3CX1200 TUBE

Full legal output with 100 watts drive.

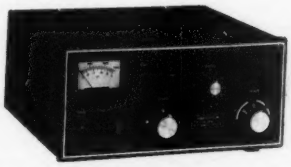
AL-1500 LINEAR AMPLIFIER

WITH EIMAC 8877 TUBE

Full legal output with 65 watts drive.

The cooling system in both amplifiers keeps the tube safely below the manufacturers ratings even when operating at 1500 watts output with a steady carrier. The filament supply has inrush current limiting to insure maximum tube life.

Size: 18½"D. x 17"W. x 10"H. Wgt. 77 lbs.

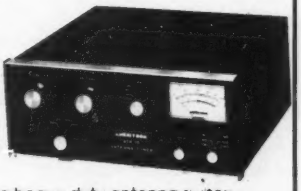


AL-84 LINEAR AMPLIFIER

The **Ameritron AL-84** is an economical amplifier using four 6MJ6 tubes to develop 400 watts output on CW and 600 watts PEP on SSB from 160 through 15 meters. Drive required is 70 w typical, 100 w max. The passive input network presents a low SWR input to the exciter. Power input is 900 watts. The AL-84 is an excellent back-up, portable or beginner's amplifier.

Size: 11½"W. x 6"H. x 12½"D. Wgt. 24 lbs.

ATR-15 TUNER



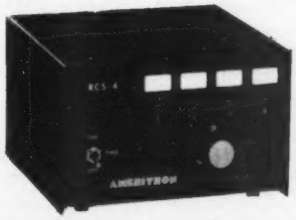
The **Ameritron ATR-15** is a 1500 watt "T" network tuner that covers 1.8 through 30 MHz in 10 dedicated bands. Handles full legal power on all amateur bands above 1.8 MHz.

Five outputs are selected from a heavy duty antenna switch allowing the rapid choice of three coaxial lines, one single terminal feed or a balanced output. An internal balun provides 1:1 or 4:1 ratios (user selectable) on the balanced output terminals.

A peak reading wattmeter and SWR bridge is standard in the ATR-15. It accurately reads envelope powers up to 2KW.

Size: 6"H. x 13¼"W. x 16"D. Wgt. 14 lbs.

Remote COAX Switches



RCS-4 FOR CONVENIENT INSTALLATION

No control cable required.
Selects one of four antennas.
VSWR: under 1.1 to 1 from 1.8 to 30 MHz.
Impedance: 50 ohms.
Power capability: 1500 watts average, 2500 watts PEP maximum.

RCS-8V FOR SPECIAL APPLICATIONS

Selects up to five antennas.
Loss at 150 MHz: less than .1 dB.
VSWR: under 1.2 to 1 DC to 250 MHz.
Impedance: 50 ohms.
Power capability: 5 kW below 30 MHz, 1 kW at 150 MHz.

Available at your dealer. Send for a catalog of the complete AMERITRON line.

AMERITRON
9805 Walford Avenue • Cleveland, Ohio 44102
For more information: (601) 323-9715 • **Technical inquiries:** (216) 651-1740

CIRCLE 314 ON READER SERVICE CARD

Never Say Die

Continued from page 6

ting ham radio growing, nothing is going to change. Why should it?

UPS—1; Amateur Radio—0

You mean they actually took part of the amateur 220 MHz band away for United Parcel? Hey, they can't do that! Oh really? Well, it did take a while for us to lose it, but we managed.

I remember several years ago when I proposed that we set up the middle 3 MHz of 220 as a no-code entry ham band for newcomers in order to get some activity in it—use it or lose it. The FCC liked the idea and tried hard to get a no-code license going. The League got their member clubs to kill off the FCC's plan, with our old timers cheering their victory. I hope the ashes of that victory taste good now.

As I reported in my editorials, the FCC was extremely concerned about the drop in new hams, particularly when their Long Range Planning Committee (LRPC) looked over the potential for providing emergency communications and found that amateur radio—and only amateur radio—had the potential for providing this badly needed service.

The LRPC also found that the volume of traffic that any serious emergency would generate was way beyond the capability of what a few hams, working with 40-year-old technologies, could possibly handle. More hams were needed. We needed a whole lot more hams. We also needed to encourage these new hams to develop reliable automated high speed communications systems, something old timers will obviously fight to the death to keep from doing.

After researching the situation, the FCC decided that the only viable solution to getting more hams was to do away with the code test, that youngsters everywhere agreed was their major stumbling block. When this proposal was killed by the ARRL, the FCC disbanded the LRPC and the amateur radio National Industry Advisory Committee (NIAC) and gave up even trying to solve the emergency communications problem, despite its critical importance to our country.

I wrote about the above situation in my editorials every step of the way and warned that the next step was obvious: the FCC would parcel out our ham bands so they could be used more productively. I was called "controversial" for writing such obvious rubbish.

So what band do you think will get pruned next? Let's see, we've recently lost a big chunk (25 MHz), 30% of the 1300 MHz band, and now 40% of the 220 MHz band. Anyone want to take bets on the FCC finding better uses for 430 MHz? Heck, I wouldn't buy futures on any of our microwave bands. They're worth billions on the market, and we flat out aren't using them. We don't even have a prayer of getting the new and young hams we'd need to get activity going on our microwave bands. No, without some major changes in the ARRL resistance to no-code, I don't think we're ever going to really need or use our most valuable ham bands—the microwaves.

Now don't go panicky and start selling your two meter HTs off cheap. There'll be a good market for these for many years—a very lucrative market. As long as we continue to outlaw drugs, there'll be an increasing need for two meter ham gear to coordinate smuggling and drug deals.

"So what band do you think will get pruned next?"

My Take

I've heard all the complaints about the kids, but they're the product of their parents—and that's you. It's you who have turned your kids over to the TV set. It's you who've let our educational system turn to mind rot. So let's not blame the kids. If they're lazy it's because we've taught them to be lazy—or, more likely, we haven't bothered to teach them anything.

How do you teach kids to work hard for what they want? One way is by not giving them things they haven't worked for. I know that's a novel concept. Do you mean to tell me that showering things on a kid is going to spoil the kid? Ridiculous!

You train kids the same way you do animals. You convince them that what you want them to do is what they want to do. You show them the benefits of doing what you want. No, punishment doesn't work with animals, nor with kids. You give positive reinforcement when they do right and urge them on to do better when they do wrong, which they will.

If we want kids to get interested in amateur radio we have to convince them that there are some benefits—like it being fun. Right now we've convinced them that getting a ham ticket is a major drag. The few that are curious enough to come to a ham club are, at the very best, ignored. More likely they are both ignored and are bored to tears, finding the club is merely an old-man's preserve.

I've a challenge for you. Every one of you at one time or another comes into contact with a youngster in the 10–15 year range. Get off your big high horse and talk with this youngster and get his or her perspective on amateur radio and let me know what you find.

Then, if you're a glutton for misery, let's see if you can convince this small person that he or she wants a ham license. Then explain about the code and let me know what happens. Come on, come out of your shell and find out about the real world of the late 80s. Find out why your grandchildren aren't interested in ham radio. Most of 'em aren't doing anything else much.

Buying A License

Since my editorial mentioning that a growing number of VECs have been selling ham tickets I've had a string of phone calls and letters (usually with $50 bills enclosed) asking for the names of these VECs so the callers can buy their licenses.

Now, before you get all upset over this, and I know you'll try, you should know that each of these people have what they felt were legitimate reasons for buying their licenses—in every case it was the code. For instance there was one chap of 70 who's had seven heart by-pass operations and who's doctor has forbid him from tackling the code—the tenseness involved could kill him.

This chap has petitioned the FCC for a special dispensation. The FCC's response: drop dead. So now he'd like to find a VEC willing to help him out.

My explanation to all these callers - and there are often several a day - is to get in touch with W5YI, who has set himself up as the VEC king, and who knows far more about the situation than I.

To those who are aghast at VECs taking advantage of this business opportunity, I might point out a couple of things. First, outside of Puerto Rico, where the discounting seems to have gotten out of hand, with thousands of Extra licenses being sold cut rate, VECs have been more circumspect, and thus most are still in business. The FCC finally put the lid on Puerto Rico only a year or so after my report on the subject in *73*. Speedy for a government agency.

Considering the recent loss of 40% of 220, I wonder if even the most fanatic old timers aren't beginning to question their religious convictions? The pool of amateurs is leaking like a sieve, with the number of newcomers down 19% in just the last year. Will the day come when we'll be petitioning the FCC to allow CBers to use some of our unused ham bands just to keep them from being sold to business interests such as UPS?

Such an idea is preposterous, obviously. Who wants all those crummy truckers on our valuable 900 MHz band, right? Well, it's unlikely we'd attract the truckers, but we might look like fun for some of the kids who satisfy their urge to communicate by opting first for CB, and then find it such a hassle that they get all over the urge before they ever even hear about ham radio.

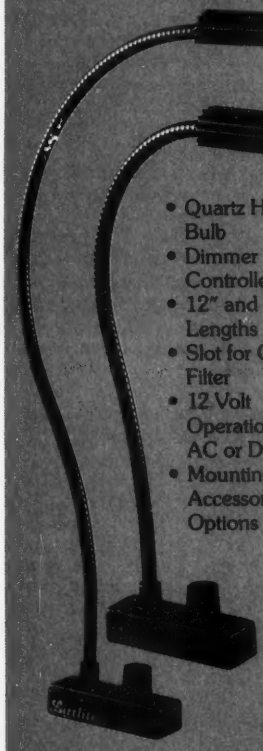
Death before dishonor is the slogan. We'd rather see amateur radio given away to Motorola and General Motors than compromise our religious beliefs about the code. Being a firm believer in the therapeutic value of strong religious beliefs, how can I honestly raise any objection? No, I believe we should start making ham club flags with code keys on them that we can use during our ham reunion meetings after all our bands are long gone.

Why am I so hepped up about keeping the code? Some say it's because I'm selling Morse Code tapes—the very best ever made by a long shot—and it's my personal greed that makes me so adamant about the code. My tapes have helped tens of thousands of hams get their ham licenses. I can't say painlessly, because my tapes are the most bitchin' ever made. They are an exercise in self-torture. But they

Continued on page 86

Littlite

Gooseneck Lamps and Accessories



- Quartz Halogen Bulb
- Dimmer Controlled
- 12" and 18" Lengths
- Slot for Color Filter
- 12 Volt Operation, AC or DC
- Mounting Accessory Options

Performs with consistent reliability providing dimmer controlled illumination for late night DX'ing.

$49.95 Includes shipping & handling

VISA MasterCard

Credit card customers can order by phone, Call: (313) 231-9373

Send To:
Littlite/CAE Inc.
P.O. Box 430
Hamburg, MI 48139

☐ My check or money order is enclosed.
Charge: VISA ☐ MasterCard ☐
Acct No._____Exp____/____

PLEASE PRINT CLEARLY
Name_____
Address_____
City_____
State_____Zip_____
Phone ( )_____
Sign Here_____

CIRCLE 278 ON READER SERVICE CARD

QSYer

The Most Used Accessory in Any Station

The QSYer's effortless, lightning-fast frequency selection opens up your rig to its full potential. Whether you're contesting, DXing, ragchewing, or mobiling—you'll do it better, faster, and easier—and have more fun—with a QSYer.

Order the **KW-QSYer** for the Kenwood 940, 440, 140, 680, 711 and 811; the **757 QSYer** for the FT-757GX; the **757-II QSYer** for the FT-757GXII; the **767 QSYer** for the FT-767GX; the **747 QSYer** for the FT-747GX; or the **735 QSYer** for the IC-735. (Kenwood rigs must have the appropriate Kenwood IC-10 or IF-10 interface installed.)

$99.50 plus $2.50 S&H (Visa/MC accepted) from:

Stone Mountain Engineering Company
Box 1573 • Stone Mountain, GA 30086
404-879-0241

CIRCLE 347 ON READER SERVICE CARD

RAISED PRINT QSL CARDS

From Dennis, WA5QMM

Offset Printed - High Quality

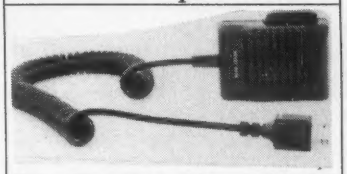
Nothing like it anywhere! You can actually FEEL the type! 17 beautiful designs including a Full-Color Eagle.

For Free samples & info. call
(318) 443-7261

Network QSL's - P.O.B. 13200 - Alexandria, LA 71315-3200

CIRCLE 114 ON READER SERVICE CARD

NOVEX Speaker Mics



High quality audio • Privacy earphone jack
Rotatable lapel clip • Hi-Lo volume switch

ICOM DMC 537I
Kenwood DMC 537K
Yaesu DMC 537Y

SUPER VALUE only $19.95
$4 Shipping & handling

NOVEX Handsets

PTT handset • backlit DTMF • Private listening
Wired for most current ICOM, Kenwood, Yaesu & others (on special request)

ICOM HCS701I, Kenwood HCS701K, Yaesu HCS701Y
Available for many other radios at slightly higher prices.

Introductory price $79.95
$4 shipping & handling

EEB
Orders: 800-368-3270 Local & tech info 703-938-3350
Electronic Equipment Bank
516S Mill St. NE, Vienna, VA 22180
(just minutes from Washington, DC)

Measure Up With Coaxial Dynamics Model 83500 Digital Wattmeter

The "Generation Gap" is filled with the "new" EXPEDITOR, the microprocessor based R.F. AnaDigit System.

The EXPEDITOR power computer... you make the demands, it fills the requirements.

- Programmable forward AND reflected power ranges.
- Can be used with the elements you now have.
- Compatible with all Coaxial Dynamics line sizes and power ranges.
- 18 scales from 100 mW to 50 kW.

Contact us for your nearest authorized Coaxial Dynamics representative or distributor in our world-wide sales network.

COAXIAL DYNAMICS, INC.
15210 Industrial Parkway
Cleveland, Ohio 44135
216-267-2233 1-800-COAXIAL
Telex: 98-0630

Service and Dependability...A Part of Every Product

CIRCLE 186 ON READER SERVICE CARD

Never Say Die

Continued from page 84

sure knock down the time it takes to learn the code. They are not for people with seven heart by-pass operations. They probably wouldn't live a day after getting 'em.

You think you're upset with Wayne Green? You should talk with anyone who's used my code tapes. They may have their Extra Class license, gotten fairly and squarely, but they'll sputter in anger at the fiendishness of my tapes. Heh, heh! But the money that pours in for the tapes is used for a good cause. It goes to make up for the boycotting of *73* by several major advertisers who prefer to get fewer sales per ad dollar spent in another ham magazine that shall go unnamed, but which is fast sinking due to the poor ad results it provides. It would be unethical to mention which magazine this is.

The whole Novice code thing is moot anyway. My sales of Novice code tapes have plunged to near zero as a result of the recent article in *73* that explained how to pass the Novice license without even bothering to learn the code. And, with 10 meters wide open these days, what are newcomers waiting for? Pass the word.

ARRL Declares War On FCC

The League, in a move that could easily move the FCC to step up their re-allocating of relatively unused ham bands in retaliation, seems to be at war with the FCC. President Price, apparently not considering the ramifications of his statements, said, "We've lost a battle, but not the war." He went on to threaten carrying the battle to Congress, into the courts and to the administration. Just what we need, the gauntlet thrown down.

Is it smart politics to threaten to harass the FCC to force them to do what we want? Mightn't this lead to some thoughts of getting even? Hey, we're dealing with the landlord here—one who is in the comfortable position of making all our laws. If we cause too much aggravation we could get thrown out.

So should we, as ARRL members, enlist in this holy war by the ARRL against the FCC? I suspect we might do better to learn from this one and, for a change, do our homework. If, instead of trying to fight the FCC on the 220 proposition, we'd come to them with a practical plan for utilizing the band, I think we might have won the day.

We're wide open for further cuts of our bands. We're flat out not using six meters these days. There are only a handful of active hams there. How many six meter construction projects have you seen in *QST* in the last five years? And what about 900 MHz? How many projects for getting on that band have you seen anywhere? A couple of our ham manufacturers have stuff for 1296 MHz, but outside of a few moonbounce groups, what are we using the band for? As far as I know, 99% of the world activity on 1296 is in Japan.

If the League would use some of its millions of dollars, that it has saved for a rainy day, to get us more hams—younger hams—instead of spending it on a legal war with the FCC, that has the almost unlimited resources of the government behind them—wouldn't we be better off? What do you think?

I'm a big fan of the ARRL, and they do a lot of great things, but I wonder if this war they've chosen against the FCC might not turn out to be as disastrous as that Iraq-Iran war. Let's cool down President Price and try to get the FCC to work with us to rebuild our dying hobby. I've never found the FCC to be against that—only frustrated at the League for fighting them in their efforts to help us. I suspect the two MHz loss on 220 has more to do with this frustration than with the needs of the UPS. The FCC may be trying to get our attention. So are we going to become even more self-destructive and possibly trigger further losses?

Use CB

A call from an outraged Chicago ham asking for advice got me to thinking. He'd come across what he'd perceived as an emergency, so he called into the 88 repeater (paid member) and asked someone to call in a 911 for him. He was told to stop his car and use a telephone—to get off the repeater.

So naturally he complained to the FCC, who as usual didn't want to be bothered. I was next in line for the hand-wringing.

It's been a while since I've written about this, so I guess it's time to re-explain the facts of life. First, in case you missed what's been going on, we're now giving our own license exams and we're supposed to be self-policing. So stop wasting the FCC's time when you have a beef and do the self-policing. All bitching to the FCC does is make them more anxious to get rid of our frequencies to someone who will cause them less trouble, and there are stacks of commercial services and their lawyers just waiting to explore our every weakness. Why bother with a bunch of whining, troublesome old men who are doing little of value for anyone, including themselves?

I've had several occasions where I've needed help while driving. I remember once I was driving to New York to visit my folks for Thanksgiving. The traffic in Connecticut was terrible, so I wanted someone to call my folks collect for me to let them know I'd be an hour late, and not to hold dinner. There was no possible way to stop to make the call. I tried several repeaters, but was turned down by all of them. So I went to CB and got fast, happy service. They even called on their dime instead of collect!

". . . anyone with any interest in personal progress (should) read at least 50 magazines a month."

What a pity! Here we have a hobby that holds the keys to the world of electronics and communications. We have a hobby that not only allows, but encourages us to educate ourselves, and we waste this incredible resource almost totally by using it purely for our own personal entertainment—with not a little back-biting thrown in.

Isn't it odd? Here we have most of the religions of the world telling us that love and friendship are important. You want love? You get on the air and try to help someone and see how many angry, bitter ops are all over your case. If you want to help get medical supplies to Africa, you'll have someone jamming you. Max Meyers W2BIB is gone now, but I'm sure we have no shortage of volunteers to take over his nastiness and perpetuate it.

I suggest an investment in one new piece of ham gear for the shack. This is a large mirror to hang over the rig so you can take a good look at the chap who is broadcasting from your station. You really want to suffer the agonies of hell? Invest further in a cassette recorder and tape your end of a few contacts. The hell will come when you sit there in front of your mirror and listen to yourself, when you force yourself to hear what the chaps you've been contacting have had to listen to. I'll bet you can't stand it for two minutes. Repent!

When's the last time someone told you that the contact with you was really fun? That they honestly enjoyed it? Let's see, was it 1963 or 1953? We were all off the air in '43, so it wasn't then.

As you sit there sarcastically putting things and people down, or, worse, mindlessly reciting your rig and antenna setup—instead of trying to find out what your contact is interested in—perhaps you'll understand why amateur radio is a dying hobby.

Let's take this self-policing to heart. And self-regulating. This means starting with yourself. Are you spreading fun and love over the air, or anger? Other than getting even for something which is your own personal devil, I don't know of any rational excuse for not being fun to contact. If the only jokes you know are ethnic or dirty, buy a better joke book. If all you can do is complain, do it into your tape recorder, not over the air.

Now, about having interesting contacts. How many magazines do you read a month? Kami, in his book "Trigger Points," says he reads 150. He recommends that anyone with any interest in personal progress read at least 50. If you read Discover, Popular Science, Business Week, Newsweek, Fortune, Scientific American, Analog (the fact article), New Age, National Geographic, Car and Driver, Consumer Reports, US News, Insight, Kappan, Educational Digest, New York, The New Yorker, Reader's Digest and Omni, it's a start. If those don't give you enough to talk about for the next month, you have an even worse problem than I thought. I scan through 250 magazines a month—computers, electronics, audio, photography, music, ham, communications, skin diving, cars, business, education. And I read a few books, too. I want to understand as much as I can about as many things as possible—don't you? 73

29th ANNUAL

TROPICAL HAMBOREE

A.R.R.L. FLORIDA STATE CONVENTION

FEBRUARY 4-5, 1989

TAMIAMI PARK FAIR GROUNDS
10901 S.W. 24th Street (Coral Way), Miami, Florida
HOURS: 9 A.M.-5 P.M. SATURDAY • 9 A.M.-4 P.M. SUNDAY

FREE PARKING 15,000 VEHICLES •
1,000 INDOOR SWAP TABLES •
300 CAMPSITES WITH FULL HOOKUPS •

• 200 COMMERCIAL EXHIBIT BOOTHS
• COMPUTERS & SOFTWARE
• LICENSE EXAMS

Registration: $5.00 Advance — $6.00 Door. Valid Both Days. (Advance deadline January 30th.)
Swap Tables, 2 Days: $16.00 each. Power: $10.00 per User.
All swap table holders must have registration ticket.
Campsites: $12.00 per Day • Includes Water, Power, Sanitary Hookups & Showers.
(All RV vehicles, tent campers, vans, trailers welcome — no ground tents, please.)

Make Checks for Registration, Swap Tables & Campsites Payable to:
Dade Radio Club & Mail As Follows:

Tickets & Hotel Info Only: Evelyn Gauzens, W4WYR, 2780 N.W. 3rd St., Miami, FL 33125
Swap Tables, RV, Tickets & Hotel: John Hall, WD4SFG, 8670 S.W. 29th St., Miami, FL 33155
RV & Tickets Only: Dick Leisy, W4OOH, 650 W. 63rd Dr., Hialeah, FL 33012
Exhibit Booth & General Info: Evelyn Gauzens (address above) or Call (305) 642-4139 or (305) 233-0000

(BROCHURE WITH FULL DETAILS AVAILABLE DECEMBER 1st)

GIVE YOUR EARS A BREAK ON **HF!**

Auto-Kall® HF Alert

• Encoder / Decoder-use with SSB / CW / FM / AM, Novice to extra • Encoder sends 2 strings of "dits" at precise speed, 225 combinations • Decoder mutes speaker until signaled • Built-in speaker • Alarm enable output • Mobile mounting bracket • 13.8 VDC • Easy to hook up • Great for mobile to base use, HF traffic nets, etc. Send or call for complete info

MoTron Electronics
695 W. 21st Ave.
Eugene, OR 97405

Introductory price: $129.95
($4 Shipping/Handling U.S.A.)

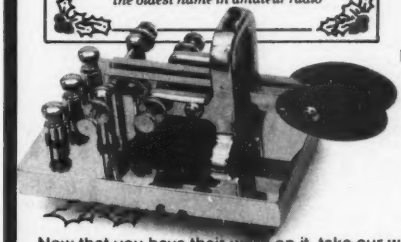
Orders **1-800-338-9058** Info **(503) 687-2118**
TLX 984794

CIRCLE 127 ON READER SERVICE CARD

Give a piece of history, give....

VIBROPLEX®

"the oldest name in amateur radio"



NOW ORDER TOLL-FREE!
DIAL **1-800-AMATEUR**

Hear what experienced operators say about Vibroplex

Barney E. Severns WB6QGG
". . . . It's a pleasure to find a few "old-time" companies still doing business in the old manner. 73's . . ."

Richard M McGarry W4CXH
"After more than 40 years of dealing with Vibroplex, I would like to thank you for the many courtesies extended to me. I think you are exemplary of the old-time American companies that provide **service** . . ."

Now that you have their word on it, take our word. Vibroplex guarantees satisfaction. Order your key today. Also available: carrying cases and other key gifts.

See your dealer or write for an illustrated catalog detailing our world famous products to: The Vibroplex Company, Inc. P.O. Box 598 DTS 98 Elm St. Portland, Maine 04101

CIRCLE 361 ON READER SERVICE CARD

Short Broadband Dipoles & Slopers

Trapless 3-conductor legs create short antenna with broad 2- & 3-band resonance.

FB Dipoles

FB 80/40/15	62'	
(•CW •Center •LSSB •HSSB)		$79.95
FB 40/20	31'	$69.95
FB 20/10	16'	$59.95

When ordering add $5 P&H
Infopack $1 by 1st class mail.
Box 50062-S, Provo, UT 84605

Trapless 2 & 3 band FB HalfSlopers

FB 160/80/30 CW	70'
FB 160/75 SSB	62'

$69.95

•2KW •Efficient •Coax Fed •Ready to Use •No Caps or Coils •Fully wx sealed & insulated

AntennasWest
(801) 373-8425

CIRCLE 107 ON READER SERVICE CARD

ATLAS TEN METER MONOBAND TRANSCEIVER MODEL AR2510 30 WATTS AM, FM, CW, SSB. LCD FREQUENCY DISPLAY. MUCH, MUCH MORE. TWO YEAR WARRANTY, FULL REPLACEMENT, NO QUESTIONS ASKED. ORDER FROM THIS AD. PRICE $219.95—PREPAID ALL FIFTY STATES. PLEASE CALL THE ORIGINAL:

ATLAS RADIO INC.

516-678-3904
P.O. BOX 763
LYNBROOK, NEW YORK 11563 USA
EXPORT INQUIRIES INVITED.

CIRCLE 105 ON READER SERVICE CARD

NEW ONLINE CALL DIRECTORY

Our new *HAMCALL* service gives you 494,114+ Hams, via your computer. $29.95 per year — unlimited use!

BUCKMASTER PUBLISHING
Mineral, Virginia 23117
703: 894-5777 800: 282-5628

CIRCLE 156 ON READER SERVICE CARD

ADVERTISERS

R.S.#	page
65	AEA ... 100
•	ARRL ... 99
243	AXM ... 101
279	Ace Communications (CA) ... 42
355	Ace Communications (IN) ... 71
335	Ace Systems ... 65
86	Aero Space Consulting ... 89
•	Alford Amateur Radio Club ... 37
67	Alinco* ... 94
194	All Electronics ... 76
•	Amateur Electronic Supply* ... 54
4	Amidon Associates ... 96
89	Antennas West ... 96
90	Antennas West ... 89
236	Antennas West ... 71
302	Antennas West ... 26
303	Antennas West ... 28
304	Antennas West ... 99
5	Antennas West ... 101
107	Antennas West ... 87
82	Antennex ... 61
271	Antique Radio Classified ... 71
338	Ashton ITC ... 21
•	Associated Radio ... 78
16	Astron Corp. ... 41
357	At Fab ... 78
363	Atlas Radio ... 103
105	Atlas Radio ... 87
158	Azimuth Communications ... 78
53	Barker and Williamson ... 76
41	Barry Electronics ... 43
42	Bilal ... 96
94	Bill Trulock K9RKA-ATV ... 53
176	Bird Electronics ... 37
156	Buckmaster Publishing* ... 87
7	Buckmaster Publishing* ... 89
•	Butternut Electronics ... 32
358	C & S Sales ... 71
•	C.O.M.B. ... 61
•	CBC International ... 53
•	CES ... 75
344	Call Sign Cups ... 28, 71, 99
157	Cleveland Institute ... 47
186	Coaxial Dynamics ... 85
343	Comm-Pute ... 28
99	Communications Concepts ... 96
121	Communications Electronics ... 34
10	Communications Specialists* ... 91
80	Compumax ... 38
345	Computer Radio ... 28
12	Connect Systems ... 1
334	Contact East ... 47
•	Control Products Unlimited ... 15
306	Creative Control Products ... 61
360	DMQ Technology ... 38
147	Data Com International ... 89
•	Delaware Amateur Radio ... 26
263	Dentron ... 101
342	Digimax ... 89
112	E.H. Yost ... 53
•	EEB* ... 65, 85, 96
133	EGE ... 104
291	Electron Processing* ... 68
8	Elktronics ... 77
•	Engineering Consulting ... 101
75	Fair Radio Sales ... 53
339	GGTE* ... 53
17	GLB Electronics ... 68
326	GTI ... 78
327	GTI ... 61
•	Giehl Electronics ... 99
72	Glen Martin Engineering ... 65
273	Gordon West Radio School* ... 61
346	Great Circle Maps ... 15
175	Hal Tronix ... 72
•	Hamtronics (NY) ... 25
309	Hamtronics (PA) ... 68
•	Heath Company ... 92, 93
13	Holly Solar Products ... 53
308	Horizon Manufacturing ... 79
269	Hustler ... 101
354	ICOM ... C2
22	Jan Crystals ... 71
272	Jun's Electronics ... 99
•	Kenwood ... C4, 7, 8, 12
11	L.L. Grace ... 58
23	Larsen Antennas ... 2
278	Littlite/CAE ... 85
281	M. Bohnhoff Productions ... 32
320	MAO Electronics ... 53
24	MFJ ... 3
314	MFJ/Ameritron ... 83
25	Madison Electronics ... 23
47	Maggiore Electronics ... 57
336	Magnaphase ... 65
•	Maryland Monogram ... 23
101	Maxcom ... 68
55	Meadowlake Corp. ... 78
114	Metro Printing ... 85
162	Michigan Radio ... 21
348	Micro Computer Concepts ... 48
295	Micro Control Specialities ... 75
252	Midland Technology ... 48
187	Mission Consulting ... 48
163	Mobile Mark Antennas ... 15
127	Motron ... 87
•	N6KW QSLs ... 53
323	National Tower ... 31
349	Naval Electronics ... 15
130	Nel-Tech ... 48
292	Omar Electronics ... 53
•	PC Electronics ... 76, 98
29	PX Shack ... 76
152	Pac-Comm ... 23
178	Pacific Cable ... 96
68	Periphex ... 28
87	Printer Productivity ... 89
30	QEP's ... 28
115	RF Connection ... 48
142	RF Enterprises ... 90
78	RF Microtech ... 26
•	RF Parts* ... 51
358	Rad-Comm ... 48
362	Radio Tel ... 99
150	Radio Works ... 48
34	Ramsey Electronics* ... 44
254	Ross Distributing ... 28
14	Sangean ... 26
332	Satellite City ... 32
	73
•	CB to Ten ... 71
•	Code Tapes ... 67
•	DX Map ... 28
•	Getting Rich ... 38
•	QSLs ... 57
•	Subscription ... 17
274	Smiley Antenna ... 79
183	Spectrum International ... 23
37	Star Tone Electronics ... 26
347	Stone Mountain Engineering ... 85
•	The Ham Station ... 75
•	Tropical Hamboree ... 87
136	Unadilla ... 48
287	Uniden/President ... 16
298	VHF Communications ... 53
79	Vanguard Labs ... 53
361	Vibroplex ... 87
38	W9INN ... 28
319	WiComm ... 48
165	Yaesu ... C3
351	Zeltwanger Electronics ... 21

*Denotes advertiser's who have contributed to the National Industry Advisory Committee (NIAC).

Index: November 1988 Issue #338

146 MHz ... 63
160 meter band ... 69
17 meter band ... 9
1750 meter band ... 51
2 meter band ... 70
2 MHz clock ... 46
220 MHz ... 4, 9, 10, 24, 35, 80
220 Notes ... 80
27C256 CMOS EPROM ... 46
27C32/56 EPROM ... 46
4X1RU/1 (EX 4Z4RU) ... 95
5089 DTMF generator ... 30
567 PLL ICs ... 49, 50
74HC CMOS logic ... 46
74HC244 buffer chip ... 46
74HC374 tri-state latches ... 46
74LS139/374 decoder chips ... 29
ADM chips ... 45
Amiga ... 77
AMSAT-NA Microsat ... 9, 60
AMSAT-OSCAR 13 ... 59-60
antenna matcher ... 62-63
antenna polarization ... 70
Apple IIe ... 77
ARRL Antenna Book ... 71
Astron RS-35M ... 24
ATV Bulletin Board ... 77
Australia ... 97
autopatch ... 4, 10, 14, 35, 36, 40
battery charging/regulation ... 52
beverages ... 69
big wheel antenna ... 71
Bird Model 43 ... 24
BNC connector ... 63
BRATS ATV Group ... 77
Buckmaster Publishing ... 9
BV2A/BV2B, Tim Chen ... 97
BY4AOM, Chang Han-Dong ... 97
C programming language ... 30
C-64/128 ... 67, 77
CB to 10 Reprints ... 85
CD4066 IC switch ... 29
CES 510SA-II ... 14, 35-36
China ... 18, 97
CMOS chip ... 14
CoCoMax ... 77
CoCo ... 77
codeino-code ... 82
ColorWare ... 77
Communications Electronics Specialties ... 14
Computer Direct ... 77
construction ... 37
COR1 identifier ... 10
crossband operation ... 39
Cushman CE-15 spectrum analyzer ... 10
data compression ... 45
dead-man timer ... 29, 33
deesse ... 4
DFC-230 Frequency Controller ... 49
DF competitions ... 19
DLC System ... 40
Docket 87-14 ... 9, 80
Docket 88-139 ... 82
DTMF ... 4, 14
dual wattmeter ... 63
dual-gate MOSFET ... 10
duplex, full and half ... 4, 36
DX ... 59, 60, 69
electrolytic gasoing ... 52
Elktronics ... 77
energy storage ... 52
EP-1550-1 ... 77
EPYX designer series ... 77
EV-1 exciter/transmitter ... 10
Falcon MOSFET amp ... 10
FCC ... 9, 80, 82
Findlay OH ATV Group ... 77
float regulator ... 52
FN42 ... 95
foxhunting ... 18-19, 59
full-wave loop antenna ... 69
G4EJA, Jeff Maynard ... 98
GE Master Pro ... 10
Glen Martin Engineering ... 11
gray line ... 60
Great Britain ... 18, 19, 95, 98
Griffin Enterprises ... 77
half-wave sloper ... 69
half-wave antenna ... 63
halo antenna ... 70, 71
Hamtronics GaAsFET preamp ... 10
Hazer Model H-4HG ... 11, 20
HPC201 ... 10
IARU ... 69
IBM PC and clones ... 27, 77
IC-375A ... 24
ICOM IC-245 ... 35
ID generator ... 45, 46
IMD ... 4
inductance meter ... 22
inverted-Vee Antenna ... 69
inverted-EB ... 69
Ireland ... 95
Israel ... 95
JFET mixer ... 51
K8OV, Joe Moell ... 18
K1ZJH, Peter J. Bertini ... 10
K2IK, Edward N. Ludin, M.D. ... 82
K7PF, P.J. Ferrell ... 45
K9XI, Art Reis ... 80
KA1XO, Hal Mandel ... 62
KB7NK, 5Z4BH ... 95
Kenwood TM-221A ... 13, 20
Kenwood TR-2500 ... 63
Kenwood TS-830S ... 49
Kenwood TX-4100A ... 39-40
Kenya ... 95
KF5WO, Jim Edrington ... 27
KF6DF, Robert Fisher ... 49
KT2B, Pete Putman ... 24
L-101 Receiving System ... 51
L-101B VLF Converter ... 51
L-400B active antenna ... 51
LAMBDA loop antenna ... 71
LF Engineering Company ... 51
Litz wire ... 51
LM311 comparator ... 30
LM324 quad op amp ... 30
loop antenna ... 69
LORAN-C ... 69
LPC chip, processing ... 45-47
Luxembourg ... 73
Maggiore Hi Pro repeater ... 10
Maggiore R4V VHF receiver ... 10
Maggiore Electronic Laboratory ... 10
Master Guide to Electronics Circuits ... 37
microsats ... 9, 59, 60
Mitel MT8880 DTMF transceiver ... 14
mobile operation ... 14, 18-19, 39, 55-56, 63, 70
Mostek 38P70 ... 14
Motorola MICOR ... 35
Motorola SRF3883 ... 24
Murata E, F filters ... 10
N6HYK, Leon Fletcher ... 73
Netherlands ... 97
NJ7G, William B. Lavin ... 82
Norfolk Island ... 98
Nye-Viking MB-V-A 3000 ... 62-63
Orion 146 MHz half-wave antenna ... 63
Orion HI-Tech ... 63
packet ... 9, 59, 95
PA0VDZ, Joseph A. Stierhout ... 97
peak power/watts, solar ... 52
peak sun hours ... 52
photovoltaic system/array/tilt ... 52
PMOS logic ... 46
power sag ... 10
propagation ... 60
quarter-wave vertical ... 69
radio direction finding ... 18-19, 59
Radio Shack PRO-2004 scanner ... 82
Radio Rose Consortium ... 46, 47
Radio Shack Color Computer ... 77
redundancy removal ... 46
repeater 4, 10, 14, 27, 29, 30, 33, 35, 36, 39-40, 45, 46
repeater controller ... 14, 27, 29-30, 33, 35, 36, 92
Republic of South Africa ... 97
reverse autopatch ... 36
RF Concepts 3-312 amplifier ... 24
RG-174/U ... 51
roller inductor ... 62
RSGB VHF/UHF Manual ... 71
RUDAK ... 59
SATFOX ... 59
series regulation ... 52
shunt regulator ... 52
simplex ... 4, 36
SmartPatch II ... 14, 35, 36
solid-state regulator ... 52
Sovonic photovoltaic panels ... 52
SPACHL ... 9
Spec-Com Software ... 77
Spectrum 77 ... 10
SSI-202 IC ... 30
StoryBoard ... 77
Taiwan ... 97
Tee antenna ... 69
Telefunkan CF-300 GaAs ... 24
telephone interconnect ... 14
T-hunting ... 18, 19
The USATVS Journal ... 77
TI LPC VSP ... 45
TMS5220C VSP ... 45-47
TRS-80 Color Computer ... 49, 77
tuner ... 49, 50, 62-63
turnstile antenna ... 70
U309 buffer amp ... 24
vertical antenna ... 69
VHF Manual ... 71
video scanning ... 77, 79
VK3YJ, J.E. Joyce ... 97
VK9NL, Kirsti Jenkins-Smith ... 98
VP2ML, Chod Harris ... 69
W1XU, Jim Gray ... 60
W3RW, Bob Wilmer ... 39
W5PFG, W. Max Adams ... 11
W7XU, Arliss N. Thompson ... 63, 70
WA4TEM, Robin Rumbolt ... 14
WA5ZIB, Andy MacAllister ... 59
WA6ITF, Bill Pasternak ... 80
WACOM WP-652 duplexer ... 10
watchdog timer ... 45, 46
WB4DCV, W.K. McKellips ... 22
WB8ELK, Bill Brown ... 77
WB8VGE, Mike Bryce ... 52
WB9RRT, Larry Antonuk ... 37, 51
WB0QCD, Mike Stone ... 77
WD0BCE, Marty Fitzgerald ... 77
William M. Nye Co. ... 62
writer's guidelines ... 9
WV5J, John Wood ... 67
WWV ... 60
XICOR 2404-type 512 byte EEPROM ... 14
ZS6ET, Peter Strauss ... 97

73 AMATEUR RADIO

FREE INFORMATION
READER SERVICE CARD

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

Tele ( ) _____
area code

November 1988—card valid until December 31, 1988. You make the *73* supporting advertisers very happy when you're interested in them . . . Wayne

1	2	3	4	5	6	7	8	9	10	201	202	203	204	205	206	207	208	209	210
11	12	13	14	15	16	17	18	19	20	211	212	213	214	215	216	217	218	219	220
21	22	23	24	25	26	27	28	29	30	221	222	223	224	225	226	227	228	229	230
31	32	33	34	35	36	37	38	39	40	231	232	233	234	235	236	237	238	239	240
41	42	43	44	45	46	47	48	49	50	241	242	243	244	245	246	247	248	249	250
51	52	53	54	55	56	57	58	59	60	251	252	253	254	255	256	257	258	259	260
61	62	63	64	65	66	67	68	69	70	261	262	263	264	265	266	267	268	269	270
71	72	73	74	75	76	77	78	79	80	271	272	273	274	275	276	277	278	279	280
81	82	83	84	85	86	87	88	89	90	281	282	283	284	285	286	287	288	289	290
91	92	93	94	95	96	97	98	99	100	291	292	293	294	295	296	297	298	299	300
101	102	103	104	105	106	107	108	109	110	301	302	303	304	305	306	307	308	309	310
111	112	113	114	115	116	117	118	119	120	311	312	313	314	315	316	317	318	319	320
121	122	123	124	125	126	127	128	129	130	321	322	323	324	325	326	327	328	329	330
131	132	133	134	135	136	137	138	139	140	331	332	333	334	335	336	337	338	339	340
141	142	143	144	145	146	147	148	149	150	341	342	343	344	345	346	347	348	349	350
151	152	153	154	155	156	157	158	159	160	351	352	353	354	355	356	357	358	359	360
161	162	163	164	165	166	167	168	169	170	361	362	363	364	365	366	367	368	369	370
171	172	173	174	175	176	177	178	179	180	371	372	373	374	375	376	377	378	379	380
181	182	183	184	185	186	187	188	189	190	381	382	383	384	385	386	387	388	389	390
191	192	193	194	195	196	197	198	199	200	391	392	393	394	395	396	397	398	399	400

Reader Service: To receive more information on the products advertised in this issue of *73*, circle the appropriate number. Please allow 6 weeks for processing of inquiry. Offer valid in the U.S. and possessions for a limited time only.

73 Magazine Product Report Card

Please rate any ham gear you're using from (0) poor to (9) superb.

Manufacturer	Model	Your Rating	When Purchased	Notes
1.				
2.				
3.				
4.				
5.				

Comments: _____

Your name, call, complete address: _____

Please vote on the ad in this issue you found most interesting: _____
Write Reader Service number here.

Place
Stamp
Here

73 AMATEUR RADIO

Reader Service Management Department
P.O. Box 5135
Pittsfield, MA 01203–5135

Place
Stamp
Here

73 AMATEUR RADIO

Editorial Office
WGE CENTER
70 Route 202 North
Peterborough, NH 03458-9995

LOGWRITE™

Are you tired of wasting your time and money on sub-par logging programs? Bring your station into the computer age with **LOGWRITE**, the quality menu driven, user friendly logging program written by Ed Troy (NG3V). **LOGWRITE** is the perfect accessory for the complete ham station. It simplifies your operation and gives you the competitive edge in contesting and DXing. **LOGWRITE** works with all IBM PCs and compatibles.

LOGWRITE's unique split screen feature allows for simultaneous logging and text processing. Logging features include:

- Instant callsign or prefix search
- Print, Edit, or View records
- Plenty of room for notes & addresses
- Automatic time/date stamping

Text processor features automatic word wrap, backspace correct, and scrolling. Throw away your pen and paper!

To order your copy of **LOGWRITE**, complete with instruction manual, send $24.95 (Pa. residents add $1.50 sales tax) to:

Aerospace Consulting
P.O. Box 156, Gwynedd, Pa. 19436

30 day money-back guarantee

Or call 1 (800) 345-4156 ext. 54 to order with Visa/ Mastercard (Please specify 3.5 or 5.25 inch floppy.)

CIRCLE 88 ON READER SERVICE CARD

Half-Square QRV-DX Monobanders

Work DX with No Tower and No Amplifier.
Cut noise, cut near sigs, build DX sigs, kill QRM.

10 Meters	15 Meters	20 Meters	40 Meters
$29.95	$39.95	$49.95	$69.95

Coax Feed, Broadside Pattern, Low Profile, Ready to Use

Highest DX Gain per Dollar

To order add $5 Postage & Handling

Infopack $1 by 1st class mail.

AntennasWest
Box 50062-S, Provo, UT 84605 (801) 373-8425

CIRCLE 90 ON READER SERVICE CARD

1988 CALL DIRECTORY

(On microfiche)

Call Directory $8
Name Index 8
Geographic Index 8
All three — $20
Shipping per order $3

BUCKMASTER PUBLISHING
Mineral, Virginia 23117
703: 894-5777 800: 282-5628

CIRCLE 7 ON READER SERVICE CARD

COMPUTERIZE YOUR SHACK

YAESU 747, 757GX, 757GXII, 767, 9600.
KENWOOD TS-440, TS-940, TS-140, TS-680.
ICOM R71A, R7000, 735, 751A, 761, 781.
DRIVERS FOR RADIOS ARE MODULAR.
JRC NRD 525.

COMPLETE PROGRAM ENVIRONMENT
MENU DRIVEN AND DESIGNED FOR EASE OF USE.
SCAN FUNCTION ADDED TO RADIOS THAT DO NOT SUPPORT IT.

MENUS FOR THE FOLLOWING:
AMATEUR HF—AMATEUR VHF—AMATEUR UHF
AM BROADCAST—FM BROADCAST—TELEVISION BROADCAST
SHORT WAVE BROADCAST
AVIATION HF(SSB)—AVIATION VHF—AVIATION UHF
HIGH SEAS MARINE—VHF MARINE
MISCELLANEOUS HF, VHF, UHF
MOST POPULAR FREQUENCIES ALREADY STORED
ADDITIONAL LIBRARIES AVAILABLE
COMPLETE LOGGING FACILITY
ALL FREQUENCY FILES MAY BE ADDED TO, EDITED OR DELETED

AVAILABLE FOR IBM PC, XT, AT, 80386 256K RAM
1 SERIAL PORT AND 1 FLOPPY MINIMUM

PROGRAM WITH INITIAL LIBRARIES **99.95**
RS—232 TO TTL INTERFACE ONLY NEEDED IF DON'T HAVE MANUFACTURERS
INTERFACE ALLOWS 4 RADIOS **99.95**
SPECTRUM ANALYZER MODULE (CALL FOR PRICE)

DATACOM, INT.
8081 W. 21ST. LANE
HIALEAH, FL 33016
AREA CODE (305) 822-6028

CIRCLE 147 ON READER SERVICE CARD

Printer Productivity remanufactures your toner cartridges. We disassemble, manually clean and inspect the cartridge, then fill with premium quality toner. **Printer Productivity** is backed by over 20 years experience in the laser printing industry. We offer free shipping via UPS for prepaid orders.

SAVE MONEY

Why throw away your toner cartridges?

SAVE A BUNDLE WITH US

ARE YOU READY TO START SAVING MONEY?

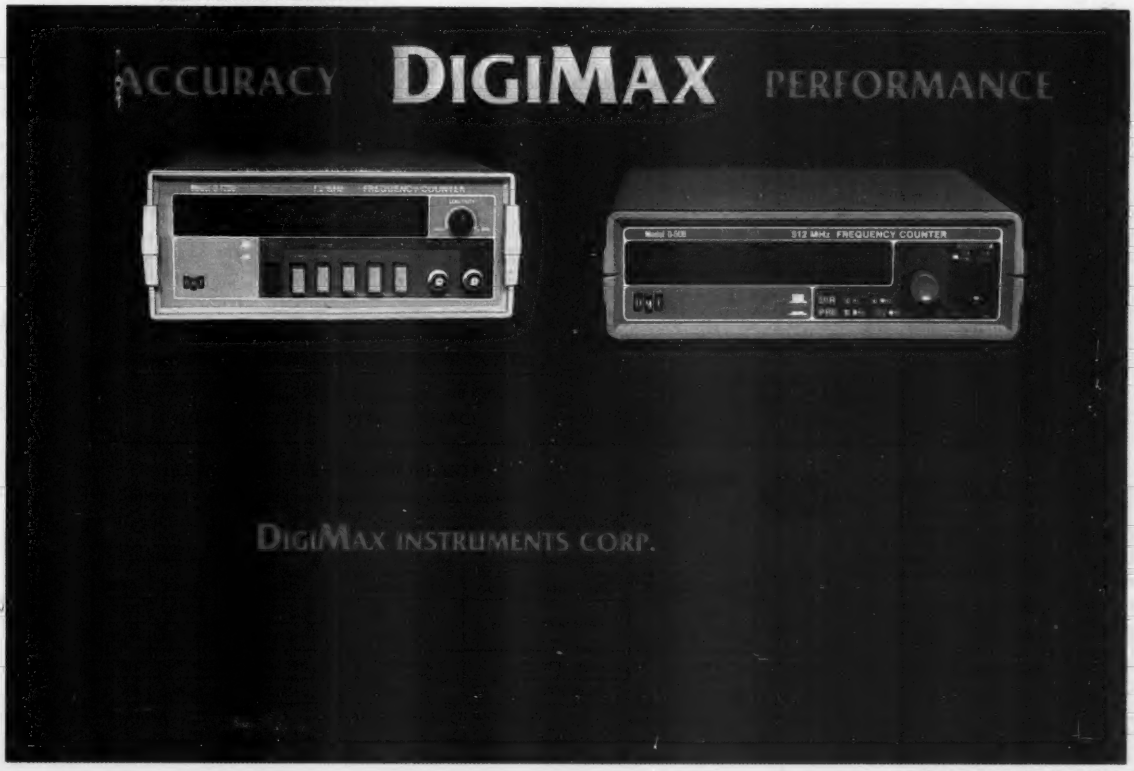
1. Place cartridge AND green cleaning wand in as much original packaging as possible.
2. Clip this coupon and include with order to receive $10 off prices below . . .
   Series I or II $79
   All Canon PC copiers $59
   Brown or dark blue $149
3. Ship to:

PRINTER PRODUCTIVITY
316 Creek Bend Drive
Woodstock, Ga. 30188
(404) 928-1587

- –Laser Printers: 30–50% more copies than a new cartridge
- –Canon PC copiers: 100% more copies than a new cartridge
- –Cartridge can be remanufactured 5–8 times
- –Higher quality prints
- –Colors: Black, Ultra Black, Brown, Blue
- –New cartridge—5¢ per copy, Remanufactured cartridge —less than 2¢ per copy
- –100% unconditional guarantee

Printer PRODUCTIVITY

CIRCLE 87 ON READER SERVICE CARD



CIRCLE 342 ON READER SERVICE CARD

rfe

• We Specialize in Antennas & Towers • We Ship Worldwide

ANTENNAS

KLM

World Class Antennas for the Serious Amateur!

KT34A.....$395.00 KT34XA.....$585.00

Monobanders: 80-10 Meters!
High Performance VHF & UHF antennas.

hy-gain

Tribanders

TH7DXS	TH5Mk2S
Explorer-14	TH3JrS

Monobanders

204BAS	205BAS
155 BAS	105BAS
103 BAS	

VHF, OSCAR & VERTICAL ANTENNAS!
NEW! High Performance 144 & 432 MHz Antennas.
Call For Prices!

cushcraft

The "A4 S" - The A4 tribander with all stainless steel hardware
Add 30 or 40 meters with stainless hardware
The "A744S"

A3/A3SK Stainless Kit.....
AT43 Add-on Kit .....
A3SK & A4SK Stainless Kits.....
AV3 & AV5 Verticals .....
AP8 & APR 18.....
40-2CD 2-el. 40 Mtr. Beam.....
CALL

Monobanders For 10, 15, & 20 in Stock!

617-6B 6 Mtr BOOMER.....
A50-5, A50-6.....
A147-11, A147-20T.....
215WB & 230WB 15 & 30 el 2 Mtr .....
AOP-1 Satellite System.....
4218XL & 3219 for 144-148 MHz.....
220B, 424B BOOMERS.....
CALL

Large Inventory Of Other Antennas & Accessories

BUTTERNUT

HF6V .....
RMK II KR.....
TBR-160S Coil.....
CALL

HF2V.....
STR II KR.....
SC-3000 Antenna...
CALL

HF5B .....CALL

ALPHA DELTA

DX-A.....$46.95 DX-DD . . 64.95 DX-KT.... 27.50

NEW! DX-CC All band dipole.....$79.95
Full line Alpha Delta switches & Transi-traps!

HUSTLER

6BTV .....$134.95 5BTV $124.95
G6-144B..... 86.95 G7-144 ..... 114.95
G7-220..... 114.95

Complete HF Mobile Systems. CALL!

MOSLEY

TA-33	CLASSIC 33
TA-34	PRO-67

TONNA

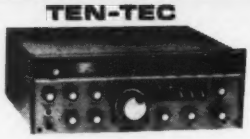
ANTENNA SPECIALISTS

ROTORS

TELEX		YAESU	
HDR-300	CALL	G400/400RC	CALL
T2X	CALL	G800RC	CALL
HAM IV	CALL	KR2000RC	CALL
CD-45 II	CALL	G5400B	CALL
AR-40	CALL		

ALLIANCE		DAIWA	
HD-73	CALL	MR 750 PE	CALL

TEN-TEC



MODEL 561 CORSAIR II

OTHER TEN-TEC PRODUCTS:
Model 585 Paragon
Model 425 Titan Linear Amplifier
Model 229A 2KW Antenna Tuner
Model 2510 Satellite Station

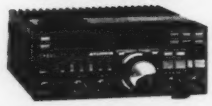
Full line of filters, power supplies, mobile antennas, and accessories in stock.

ASTRON POWER SUPPLIES

Rack mount and speaker models in stock!

RS-4A . . . $37.95	RS-7A 49.95	RS-12A . . . 69.95
RS-20A . . . 88.95	RS-35A . . 135.95	RS-50A . . 193.95
RS-20M . . 106.95	RS-35M . . 153.95	RS-50M . . 216.95
VS-20M . . 124.95	VS-35M . . 171.95	VS-50M . . 232.95

YAESU



FT-757 GXII All Mode Transceiver

AMPLIFIERS & TUNERS

MIRAGE
AMERITRON
MFJ

RFC 2-317

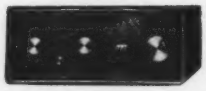
dconcepts
AMP SUPPLY
TEN-TEC

NYE-VIKING
MB-V-A

MAGNUS SOLID STATE HF LINEAR AMPS

MFJ

CLOCKS
KEYERS
ACCESSORIES
TUNERS



Model 989B
Antenna Tuner

SSB ELECTRONIC & MICROWAVE MODULES TRANSVERTERS, PREAMPS, & ACCESSORIES. CALL!

TOWERS

HY-GAIN

Crank-up, self-supporting, galvanized steel towers. SS rated at 9 ft; HD at 16 ft.

HG-37SS HG-54HD	CALL FOR PRICES	HG-52SS HG-70HD

ROHN

Self-supporting: Ratings: HDBX at 18 ft, HBX at 10 ft, BX at 6 ft.

HBX 40	$225.00	HDBX 40	282.00
HBX 48	305.00	HDBX 48	380.00
HBX 56	389.00	BX 64	429.00

Galvanized steel with base and rotor plate. Today's best buy. Freight additional but you save with our volume shipper's discount!

GUYED TOWER SECTIONS:

25G	$55.00	Sections and
45G	132.00	All Accessories
55G	165.00	Call for current prices.

FOLD-OVER TOWERS:

FK2548	CALL	FK4544	CALL
FK2558		FK4554	
FK2568		FK4564	

Prices 10% higher in western states.

ROOF TOWERS & CLIMBING BELTS.....Call!

TOWER HARDWARE

Guywire: 3/16EHS / ¼ EHS, per ft.....$0.15/0.18
CCM Cable Clamps: 3/16 / ¼.....0.39/0.49
Turnbuckles: 3/8" E & E/E & J.....6.95/7.95
½" E & E/E & J.....12.95/13.95
Thimbles: ⅛" (3/16 & ¼" cable).....0.39
Earth Anchor: 4 ft. Screw-in.....13.95
Preformed "Big Grips": 3/16 & ¼.....2.49/2.99
Guy Insulators: 500 D/502.....1.69/2.99

PHILLYSTRAN GUY SYSTEMS

HPTG-2100/-4000/-6700 Cable.....0.30/.50/.70
Cable Ends: 9901LD/9902LD.....8.95/10.95
Socketfast Potting Cmpd.....15.95

WIRE & CABLE

BELDEN COAX

9913 low loss	$0.45/ft	RG-8X(9258)	0.20
RG-213/U(8267)	0.46	RG-11A/U(8261)	0.41
RG-8/U(8237)	0.36	RG-58A/U(8259)	0.15
RG-8/U(8214)	0.40	RG-59/U(8241)	0.16

RG-214/U(8268) $2.25/ft.
450 Ohm Ladder Line.....0.10

RG-213/U (Economy cable as good as any at this price).....0.32/ft.

COPPERWELD ANTENNA WIRE
Solid: 12 ga.....0.10 14 ga.....0.08
Stranded 14 ga.....0.10

Plus Wide Selection Baluns, Insulators, Accessories

ROTOR CABLE
Std (6-22, 2-18).....0.19 Hvy (6-18, 2-16)...0.36
Others in stock.

AMPHENOL CONNECTORS
PL-259: std/silver/teflon.....0.89/1.25/1.45
UG-21B (8261) Type N Male.....2.95
T's, angles, adaptors, jacks, & BNC in stock!

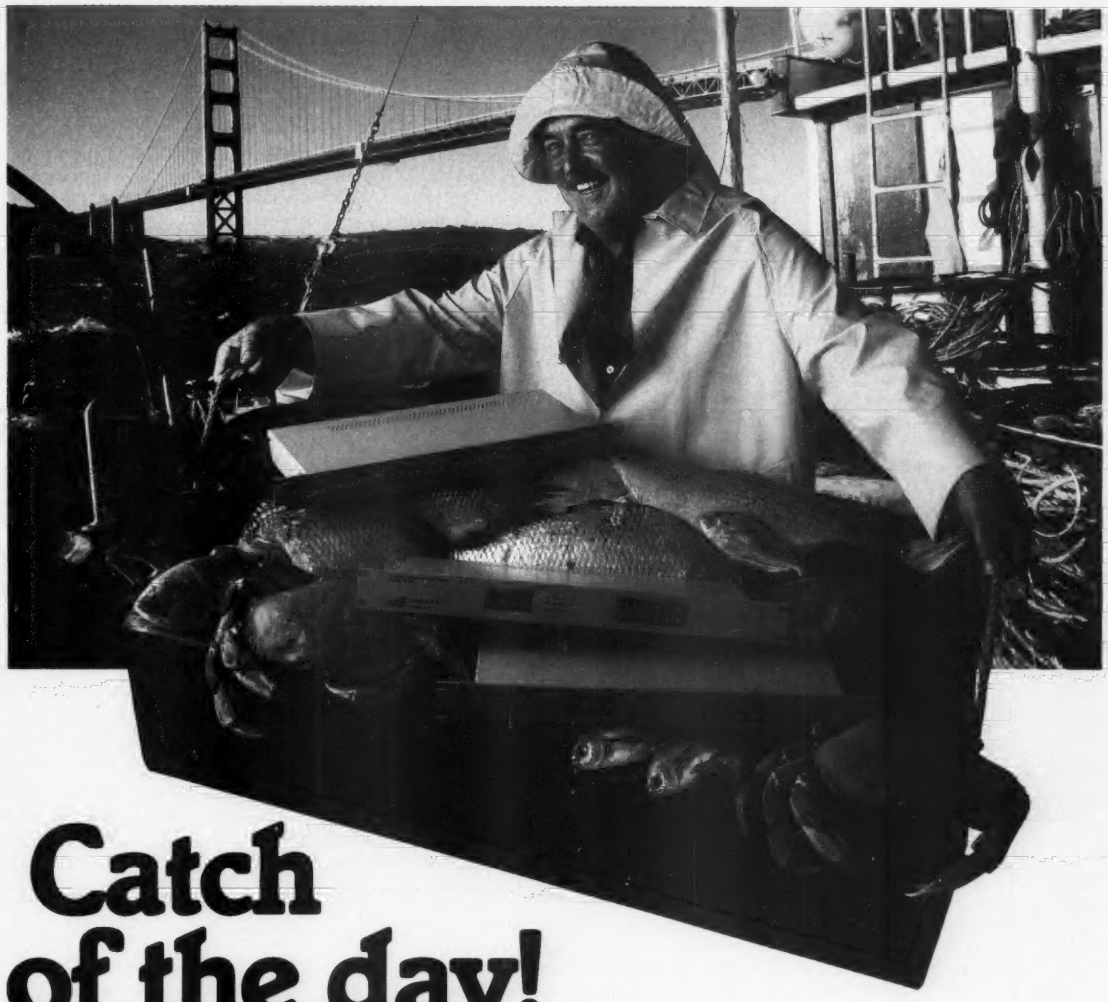
COAX AVAILABLE IN PRECUT LENGTHS WITH CONNECTORS ATTACHED.

• • COAXIAL SWITCHES • •

ANDREW HELIAX & CONNECTORS
½" LDF4-50A..... CALL 7/8" LDF5-50A..... CALL

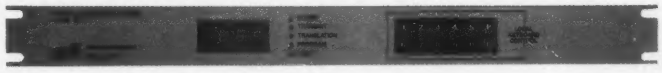
ALINCO • AMERITRON • AMP SUPPLY • ANTENNA SPECIALISTS • ASTATIC • BENCHER • B & W • CREATE • DAIWA • KANTRONICS • LARSEN • MFJ • MOSLEY • NYE-VIKING • PALOMAR • SANTEC • SHURE • TONNA • WELZ & MORE

CIRCLE 142 ON READER SERVICE CARD



Catch of the day!

Have you been trawling the bounding main for a new product? We have just netted it—the TP-38 microprocessor controlled community repeater panel which provides the complete interface between the repeater receiver and transmitter. Scuttle individual tone cards, all 38 EIA standard CTCSS tones are included as well as time and hit accumulators, programmable timers, tone translation, and AC power supply at one low price of $595.00. The TP-38 is packed like a can of sardines with features, as a matter of fact the only additional option is a DTMF module for $59.95. This module allows complete offsite remote control of all TP-38 functions, including adding new customers or deleting poor paying ones, over the repeater receiver channel.



$595.00 each
$59.95 DTMF module
$149.95 Digital CTCSS module

Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.

Now available with Digital CTCSS

COMMUNICATIONS SPECIALISTS, INC.
426 West Taft Avenue • Orange, CA 92665-4296
Local (714) 998-3021 • FAX (714) 974-3420
Entire U.S.A. 1-800-854-0547

CIRCLE 10 ON READER SERVICE CARD

TALK IS CHEAP.

Have you heard? For less than $90 your AT or XT-compatible computer can talk! All it needs is the HV-2000 Computer Voice Kit from Heathkit.

Reading letters, transcriptions and computerized instruction can be easier and quicker than you ever thought possible. Computer games gain a new dimension. Your computer can even entertain children with stories and songs.

If you have a modem, the HV-2000 Computer Voice will allow your computer to recite reference and research information from time-sharing services. Or, speak radio transmitted ASCII information.

The HV-2000 Computer Voice Card, containing speech synthesizer and audio amplifier, plugs into any AT or XT-compatible computer's expansion slot. An external speaker is also included. Versatile, Heath-developed software gives you a wide variety of voices and easy interface to high and low level languages.

The HV-2000 Computer Voice. At less than $90, talk IS cheap. To order, call toll-free **1-800-253-0570.** Use your Visa, MasterCard, American Express or Heath Revolving Charge card. Or call **616-982-3614** for the nearest store location.

Heath Company

A subsidiary of Zenith Electronics Corporation

Prices, product availability and specifications are subject to change without notice.

Lap Top

Continued from page 33

access password, tones which follow will be interpreted as control functions, permitting the control operator to enable or disable the patch or repeater. If the number sequence is a prefix and valid phone number, the phone number will be echoed back by the speech synthesizer, and the call will be placed. Numbers beginning with a 0 or 1 are rejected, to prevent long distance calls. A three-digit "speed-dial" number (including 911) will be recognized, and if a matching pre-programmed phone number is found, that number will be dialed. The program, with up to 640K of RAM available in the computer, can store phone numbers for three-digit speed-numbers from 000 to 999.

Once a phone call is established, detection of a 0, 1, or # terminates the call immediately.

Mode Control

All the above input flags and control flags are examined by the mode control logic, to determine if the operating mode should change. For example, if during the IDLE mode the receive carrier on flag is set, the mode control logic will clear that flag and change the mode to the REPEAT mode. This results in the transmitter being keyed and the receive audio being routed to the transmitter. Table 1 shows the major operational modes of the software.

Another example is when the receive carrier off flag is set, indicating that the repeater user has released his key. The next mode depends on several prior conditions. If, for example, the DTMF tone queue contains a valid access code and phone number, the next mode will be the OFF HOOK mode. This will cause the phone to be taken off hook to get a dial tone, and the phone number will be placed into the speech queue, to echo the number back to the user.

Station Identification

Four types of IDs, controlled by 3 software counters (which count the 1/18-second clock ticks), are generated. If the repeater has not been used recently, the software will generate an ID a few seconds after it is first keyed up. The ID will be CW if the input carrier remains, or voice if the user releases his key and removes the carrier. At this time, two timers will start, a convenience timer and a mandatory timer. If the repeater user releases the key after the convenience timer expires, but before the mandatory timer expires, the controller software will use this opportunity to do a voice ID and both timers will be reset. This timer is usually set to between five and eight minutes. If the mandatory timer expires (it should be less than 10 minutes), and the user has not removed his carrier, a CW ID will be generated.

These three timers will satisfy the requirements that the repeater identify itself at the beginning of, at least every 10 minutes within, and at the end of, each QSO.

Normal mode switching is delayed or interrupted whenever the ID is generated, to prevent it from being cut short by other time-outs or user action.

How Well Does It Work?

As stated in the beginning of the article, this design has been operating for nearly a year with only a few minor teething problems. At present, this approach is probably slightly more expensive than a special-built controller. At the rate the prices of microcomputers are falling, however, it may soon become much less expensive. The problems one might expect when using a computer near high power RF transmitters did not appear, and the computer did not affect the receiver.

The program to drive the lap-top repeater is too lengthy to publish here. It's available in machine-readable form from the author, on either 3½- or 5¼-inch diskettes, for $5.

This type of design is far more versatile than the usual controller, and could be expanded almost limitlessly. For example, you could attach a printer to log repeater operation and phone calls. Almost any computer accessory could enhance repeater operation. Controlling the repeater uses only a fraction of the computer's power, so the rest is on tap for whatever the programmer can dream up. 73

Parts List for the Laptop Repeater Controller

All fixed resistors are ¼ watt, 5%

R1, 12, 22	10k pot
R2	270 ohm
R3, 16	30k
R4	220k
R5	39k
R6, 17, 19, 23, 24,28	100k
R7, 10, 13, 18	15k
R8, 9, 25, 26	2.2k
R11	560
R14, 27	68k
R15, 33	27k
R20, 21	47k
R29, 30	10M
R31, 32	10k
C1, 4, 7	10µF, 20v
C2, 8, 9	0.1µF, 50v
C3	47µF, 20v
C5	0.047µF, 100v
C6	470pf, 100v
C10	30µF, 20v
Q1	2N2222 NPN Transistor
U1, U3	LM324 Op Amp
U2	LM311 Comparator
U4	SSI-202 DTMF Decoder
U5	5089 DTMF Generator
U6	74HC139
U7, 8	74HC374
U9	74HC240
U10	74LS123
U11	SN75432
Relay	12v coil, SPST
Transformer	600/600 ohm audio

Heathkit®

You're In A Separate "Class" With The SB-1400 Transceiver

The world is at your fingertips with the *NEW* Heath SB-1400 All-Mode Transceiver featuring dual VFOs and 20 memory channels. With a price tuned into your budget, the SB-1400 is an assembled SSB/CW/AM and optional FM transceiver that delivers 100W of PEP output on all nine HF amateur bands, with 100kHz-30MHz general coverage reception.

The SB-1400 is the latest addition to Heath Company's full line of amateur radio equipment – everything you need to complete your ham shack.

Heath Company also carries an extensive line of other electronic products. From computers to television sets, from test instruments to stereos, every Heathkit® product – kit and assembled – is backed by 40 years of dedicated attention to design, quality and durability.

For a *FREE* Heathkit catalog, send in your QSL card, mail the coupon below, or call 24 hours a day TOLL FREE:

1-800-44-HEATH (1-800-444-3284)

☐ *Yes, send me a FREE Heathkit Catalog.*

Send to: **Heath Company, Dept. 011-714**
Benton Harbor, Michigan 49022

Name _____

Address _____ Apt. _____

City _____

State _____ Zip _____

AM-451R1

A subsidiary of Zenith Electronics Corporation

Heath Company

ALINCO ELECTRONICS

ALINCO ELECTRONICS INC.

20705 South Western Ave., Suite 104 Torrance, CA 90501 ☎ (213)618-8616

Tiny, Tough & Terrific

NOW AVAILABLE 220 MHz "DJ-200T"

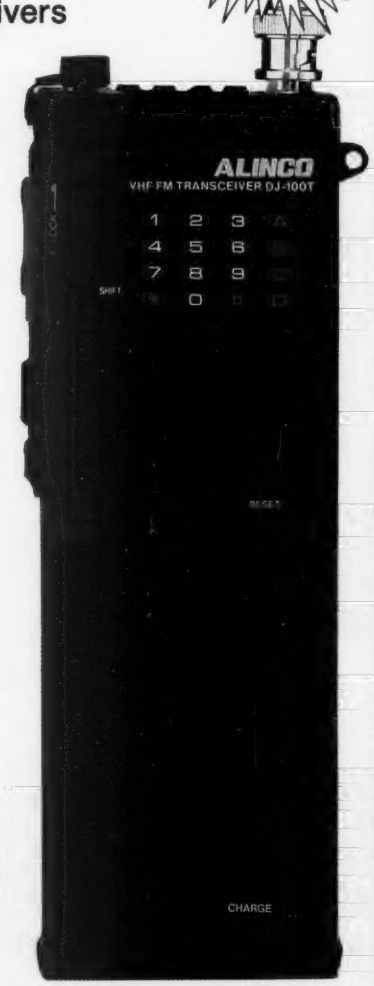
The *NEW* Generation of T.T.& T. Hand Held Transceivers From Alinco Are Just Around the Corner!

Introducing The DJ-100T 2 Meter Hand Held Transceiver

- **Tiny** = 1-3/16" D x 2-3/8" W x 6-5/8" H
- **Tough** = 6.5 Watts (With Optional EBP-8NAZ Nicd Battery Pack)
- **Terrific** = Features and Benefits

Suggested List Price $299.00

- LCD with Switchable Backlighting
- 10 Memories
- BNC Antenna Connection
- 16 Button DTMF Pad
- Easily Accessible Dip Switches For Encoding Sub Audible Tones
- Battery Save Draws 15mA For Extended Battery Life
- .20uV Sensitivity
- 144.00 MHz to 147.995 MHz
- CAP and MARS Modifiable – Simplex only
- Standard Battery, EBP-9NAZ Has DC/DC Converter Built In
- Stores Standard Repeater Offsets In Memory
- Full Range of Accessories
- 220 MHz and 440 MHz To Follow Shortly



(Optional EBP-2NAZ Ni-Cd battery)

CIRCLE 67 ON READER SERVICE CARD

Alinco's products are carried by these fine dealers

A-Tech - Burbank, CA
Amateur & Advance Comm. - Wilmington, DE
Amateur Comm. ETC. - San Antonio, TX
AES - Milwaukee, WI
AES - Orlando, FL
AES - Clearwater, FL
AES - Las Vegas, NV
Austin Amateur Radio Supply - Austin, TX
Barry Electronics - New York, NY
Burghardt Amateur Center - Watertown, SD
Colorado Comm Center - Denver, CO
Delaware Amateur Supply - New Castle, DE
Doc's Communications - Roseville, GA
El Original Electronics - Brownsville, TX
ESB - Vienna, VA
EGE, INC. - Woodbridge, VA
EGE, INC. - Salem, NH
Ericksen Communications - Chicago, IL
F&M Electronics - Greensboro, NC
Floyd Electronics - Collinsville, IL
The Ham Station - Evansville, IN
The Ham Hut - Amarillo, TX
Hatry Radio - Hartford, CT
Henry Radio - Los Angeles, CA
Hirsch Sales Co. - Williamsville, NY
HR Electronics - Muskegon, MI
HRO- Anaheim, CA
HRO - Atlanta, GA
HRO - Burlingame, CA
HRO - Oakland, CA
HRO - Phoenix, AZ
HRO - San Diego, CA
HRO - Van Nuys, CA
HSC - Santa Clara, CA
HSC - Sacramento, CA
HSC - Sunnyvale, CA
International Radio Systems - Miami, FL
Jun's Electronics - Culver City, CA
Kennedy Associates - San Antonio, TX
KJI Electronics - Houston, TX
Madison Electronics - Houston, TX
Maryland Radio Center - Laurel, MD
Memphis Amateur Electronics - Memphis, TN
Michigan Radio - Mt. Clemens, MI
Mission Consulting - Houston, TX
Missouri Radio Center - Kansas City, MO
N&G Electronics - Miami, FL
Omni Electronics - Laredo, TX
Quement Electronics - San Jose, CA
RF Enterprises - Merrifield, MN
R&L Electronics - Hamilton, OH
Reno Radio, Reno, NV
Rivendell Associates - Derry, NH
Rogus Electronics - Southington, CT
Rosen's Electronics - Williamson, WV
Ross Distributing Co. - Preston, ID
Satellite City - Minneapolis, MN
Tel-Com Electronic Comm. - Littleton, MA
Texas Comm. Center - Houston, TX
Texas Towers - Plano, TX
VHF Communications - Jamestown, NY
Williams Radio Sales, Colfax, NC

CANADA:
Canadian Distributor
Texpro Sales Inc. - Burlington, Ontario
(416) 332-0844

73 INTERNATIONAL

edited by C.C.C.

Notes from FN42

Hambassadors (correspondents) take note: *Themes for the 12 issues of* 73 Amateur Radio *for 1989 which you might want to keep in mind as you send us your reports are as follows.* ***Remember we must have reports HERE two months in advance: November 1 for the January issue, December 1 for February, etc.*** *January—Workbench/Gadgets; February—Product Reviews; March—Satellites; April—VHF and above Antennas; May—Education/Licensing/Upgrading (What is going on to promote amateur radio to young and old?); June—Field Day/QRP Operation; July—Microwave/ATV; August—Packet Radio; September—HF Antennas; October—DX; November—Annual Holiday Shopping Guide; December—HTs.*

A Word to the Wise: Don't be silly enough to believe all you hear or read about W2NSD/1. It is an election year in the USA, and Wayne is a candidate. We respect the constitutional right of free speech when criticizing, but sometimes it is exercised by individuals who misuse the privilege. This is an individual (unauthorized) editorial statement from the RP part of CCC. (For those who missed last month's column, CCC means the entire "all-C-ing" editorial staff of the magazine, acting as super-editor for the material sent in to us by our international Hambassadors.)

November's events around the world: 1—National Day, Algeria, Antigua (24th for Zaire); 3—Culture Day, Japan; Independence Day, Panama (18th for Morocco, 22nd for Lebanon, 25th for Suriname, 28th for Albania); 4—Flag Day, Panama; 7—Revolution Day, USSR; 8—Queen's Birthday, Nepal; 11—Veterans Day, USA; Armistice, France; Remembrance Day, Canada; (12th for Bermuda, 13th for Great Britain, and (Volkstrauertag) Germany; 14—Dynasty Day, Belgium; 15—Proclamation of the Republic, Brazil; 17—Army Day, Zaire; 18—National Holiday, Oman; 20—Revolution Day, Mexico; 23—Labor Thanksgiving Day, Japan; 24—Thanksgiving Day, USA; 29—Proclamation of the Republic, Yugoslavia.

Roundup

Great Britain. A "self-financing organisation that sponsors a varied award programme based on working [hearing, for SWLs] stations in Great Britain & Northern Ireland" recently presented a Diamond Award to "the first ever claimant from North America...Jim Thurber K9KQ" of Clarkson, New York (for 1100 areas logged). The Worked All Britain Awards group, which was started in 1969, makes donations to help disabled and handicapped hams. The WAB Awards are based on areas worked; the more than 4,000 areas are those created by the National Grid Reference (NGR) in Great Britain and the Irish Grid. They are 10 km by 10 km in size, up to 100 in each of the sixty-one 100 km by 100 km "large squares." The former are identified by 00–99, the latter by letters. Examples: SP42, G82.

The Awards are Basic, Bronze, Silver, Gold, Platinum, and Sapphire, for which the requirements are stations logged in 100, 200, 400, 600, 800, and 1000 areas, respectively (for European stations the requirements are 300, 500, 750, 1000, 1500, and 2000 areas, respectively). There are other area-based awards also, including (for non-European stations) the W.A.B Overseas Introductory Award calling for 25 areas and 10 (of the 78) counties. A WAB special record book may be purchased.

For further information write Membership Secretary Brian Morris G4KSQ, 22 Burdell Ave., Sandhills Estate, Headington, Oxford OX3 8ED, England, or Dave Bird AA6DB, 11226 Quinn St., Downey CA 90241, USA.

Ireland. Baile Atha Cliath (Dublin, that is), in its celebrations of "One Thousand Years as a City" (see Roundup, p. 98, April issue), worked Dublins all over the world on March 17th. The Millennium Amateur Radio Committee reports contacts with Dublins in Australia, New Zealand, the USA (in Georgia, New Hampshire, Pennsylvania, Texas, and Virginia), and on Banana Island off Sierra Leone. The call was EI1000; a pre-stamped QSL card from the Irish Postal Service is available direct at PO 2223, Dublin 1.

Israel. From Ron Gang 4X1MK: The four stations for the 40th Anniversary in April (of both Israel's independence and the IARC), 4Z40I, 4X40A, 4X40R, and 4Z40C, made tens of thousands of contacts, and QSL cards have gone to all stations QSO'd. A special certificate is available to any who contacted all four stations—application with documentation and US$5 or ten IRCs should be sent to Anniversary Certificate, IARC, PO Box 4099, 61040 Tel-Aviv, Israel.

4X1RU/1 (ex 4Z4RU) is the call of Jim's packet gateway station tying the national 144.675 MHz network with HF on 14.1075 LSB. Alon 4Z4ZB also has 4Z4SV/1 running a BBS on the same frequency in the evenings. Packet has caught on by leaps and bounds in Israel, and one out of every ten stations now has packet capability.

Kenya. From Rod Hallen KB7NK, 5Z4BH (Box 55, APO New York 09675): The Radio Society of Kenya (RSK), IARU-affiliated, is a very active group indeed. Consisting mostly of Europeans and Americans, it is working to get Kenyans involved, with classes in basic electricity and Morse code. There is no Novice license now, but the club is working to rectify that. It also sponsors an SWL program and issues identifiers (e.g., RSK–001, RSK–002, etc.). The club has one 2-meter repeater in Nairobi and soon will have a 70cm one on Mount Kenya. An FM repeater is planned. There is no reciprocal licensing with the U.S., but licenses are routinely issued (a 2–3 month process) to anyone holding a General or higher class license from his home country, or to anyone passing a Morse, theory, and regulations test. Licenses are renewable annually.

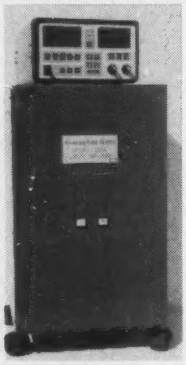
CCC invites 5Z4BH to be a roving Hambassador for Africa—but where will we mail his free subscription? One of his main interests is DXpeditions ("being one, that is, rather than working one"), and for the next four years he "will be traveling extensively in East Africa and would like to operate from as many countries as possible." Bill KE3A will be handling his QSLs.—Ed.

the 230A Linear Amplifier

Something new in a high power, high quality, HF linear amplifier

The Advanced Radio Devices (ARD) 230 series represents a new generation in high power linear amplifiers. Utilizing microprocessor control, the 230 provides full "HANDS OFF" automatic operation.

- Full power is always available
- Completely automatic
- Microprocessor controlled tuning
- No time limit for QRO
- Full QSK
- LCD metering
- VSWR readout
- Microprocessor controlled protection
- Automatic tube monitoring
- Easy modification for 10 meters
- RS-232C output for external control
- Modular construction
- Export/commercial versions available
- Remote antenna switching control
- Remote control up to 250 feet away
- UPS shippable (3 boxes)



Frequency: all amateur (1.8 - 21 MHz)
Drive: 50 - 80 watts for full output
Output: 1500 watts PEP
Input Impedence: 50 ohms unbalanced
Input VSWR: 1.5:1 (higher on WARC)
Output Impedence: 50 ohms unbalanced
Harmonic Supp: greater than -45 dB
Intermod prods: more than -35 dB down
Duty: CCS (cont. commercial svc.)
Tubes: EIMAC 3CX800A7 (two)
ALC: 0 to -6 VDC
Output Configuration: Pi-L
AC Power: 230 VAC at 20A
Size (WHD in inches) & Weight
Microcontroller: 10x6x9 at 5 lbs
RF/AC unit: 14x22x13 at 86 lbs

EEB

Orders: 800-368-3270

Local & tech info
703-938-3350

Electronic Equipment Bank

516S Mill St. NE, Vienna, VA 22180

(just minutes from Washington, DC)

IRON POWDER and FERRITE PRODUCTS

AMIDON Associates

Fast, Reliable Service Since 1963

Small Orders Welcome

Free 'Tech-Data' Flyer

Toroidal Cores, Shielding Beads, Shielded Coil Forms
Ferrite Rods, Pot Cores, Baluns, Etc.

12033 OTSEGO STREET, NORTH HOLLYWOOD, CALIFORNIA 91607

CIRCLE 4 ON READER SERVICE CARD

NextDay QSLs

Two-Color Rainbow Assortment

Call Today & We Ship NextDay

Boise, Ada Cty,Idaho
K7PKT

Info $1 by 1st class mail

	2nd Day	ASAP
100	$29.95	$24.95	$19.95
200	$39.95	$34.95	$29.95
400	$49.95	$44.95	$39.95
500	$54.95	$49.95	$44.95
1000	$99.95	$89.95	$79.95

All orders ppd 2nd day air / priority mail. For overnight air delivery add $10.

AntennasWest
(801) 373-8425
Box 50062, Provo, UT 84605

CIRCLE 89 ON READER SERVICE CARD

ATV CONVERTERS • HF LINEAR AMPLIFIERS

DISCOVER THE WORLD OF FAST SCAN TELEVISION

AMATEUR TELEVISION CONVERTERS
ATV2 420–450 ..... $ 44.95 Kit
ATV3 420–450 (GaAS–FET) ..... $ 49.95 Kit
ATV4 902–928 (GaAS–FET) ..... $ 59.95 Kit

AUDIO SQUELCH CONTROL for ATV
SQL ..... $ 39.95 Kit

2 METER VHF AMPLIFIERS
35 Watt Model 335A ..... $ 79.95 Kit
75 Watt Model 675A ..... $119.95 Kit
Available in kit or wired and tested

HF AMPLIFIERS use MOTOROLA BULLETINS

Complete Parts List for HF Amplifiers Described in the MOTOROLA Bulletins

AN758	300W $160.70	EB63	140W ... $ 88.65
AN762	140W ..... $ 93.25	EB27A	300W .. $139.20
AN779	20W ..... $ 83.79	EB104	600W .. $448.15

NEW!! 300 WATT 10–150 MHz Amplifier

POWER SPLITTERS and COMBINERS (2–30MHz)

600 Watt 2–Port ..... $ 59.95
1200 Watt 4–Port ..... $ 89.95

100W 420–450 MHz PUSH–PULL LINEAR AMPLIFIER – SSB–FM–ATV

KEB67–PK (Kit) $120.95
KEB67–PCB (PC Board) ..... $ 18.00
KEB67–I (Manual) ..... $ 5.00

For detailed information and prices, call or write for our free catalog.

FERROXCUBE DEVICES

VK200–20/4B RF Choke ..... $ 1.20
56–590–65–3B Ferrite Bead ..... $ .20

HEAT SINK MATERIAL

Model 99 Heat Sink(6.5x12x1.6) ..... $ 22.00
CHS–6 Copper Spreader(6x6x1/4) ..... $ 18.00
Add $2.00 additional shipping.

We also stock Hard–to–Find parts

CHIP CAPACITORS
METALCLAD MICA CAPACITORS
RF POWER TRANSISTORS
MRF141G $209.20
MRF151G $186.80
MINI–CIRCUIT MIXERS
SBL–1 ..... $ 6.50
SBL–1X ..... $ 7.95
ARCO TRIMMER CAPACITORS

Add $ 2.00 for shipping and handling.

VISA

CCI Communication Concepts Inc.

121 Brown Street * Dayton,Ohio 45402 * (513) 220–9677

CIRCLE 99 ON READER SERVICE CARD

THE 4SQTRON

ANTENNAS FROM 160–10 METERS

NEW LOCATION

NO TUNERS!
NO RADIALS!
NO RESISTORS!
NO COMPROMISE!

THREE EXCELLENT REVIEWS JUST DON'T HAPPEN BY CHANCE.
CALL US FOR A FREE CATALOG

• See review in Oct 73, 1984 • Sept 73, 1985 • March 73, 1986

BILAL COMPANY
137 Manchester Dr.
Florissant, CO 80816 PH: 719-687-0650

VISA

CIRCLE 42 ON READER SERVICE CARD

★★★★★ PRESENTING ★★★★★

CABLE TV DESCRAMBLERS

★★★★★ STARRING ★★★★★

JERROLD, HAMLIN, OAK

AND OTHER FAMOUS MANUFACTURERS

- FINEST WARRANTY PROGRAM AVAILABLE
- LOWEST RETAIL/WHOLESALE PRICES IN U.S.
- ORDERS SHIPPED FROM STOCK WITHIN 24 HOURS

FOR FREE CATALOG ONLY 1-800-345-8927

FOR ALL INFORMATION 1-818-716-5914

PACIFIC CABLE CO. INC.
[illegible] RESEDA BLVD. DEPT 1021
RESEDA CA 91335

CIRCLE 178 ON READER SERVICE CARD

Netherlands. From Joseph A. Stierhout PA0VDZ: Two *Guiness Book of Records* successes for VRZA! At the annual Amateur Radio Campingweek, we introduced the world's largest and smallest keys—PD0PHA's, 6.55 meters long, and PA3EQN's, measuring 15.48mm. PA0WX made a QSO from the camp station (PA6JUT) with PI4VRZ/A using the big one, and the little one was used to make a QSO with the VRZA station, PI4VRZ/A in Apeldoorn. (Belgium held the record for the biggest before, and maybe will now take the next step!) The protocol for the event was written by PA0JY, and the officials were Chairman PA0PRT and PA0VYL, an official from Radio Controle Dienst, the Dutch PTT.

A steam train was chartered for the hundreds of camping amateurs for a "train-mobile" trip from Dieren to Apeldoorn and back. A 220-volt generator fed two transmitters (80 and 2 meters), and we had a 5/8-wavelength antenna for the latter and a halfwave dipole stretched over the tops of two carriages. "The only trouble was sometimes the TRX [had to go] QRT [since before each] tunnel the antennas had to be let down."

Republic of South Africa. *[Welcome, our new Hambassador, Peter Strauss ZS6ET, who will appear in our January issue with licensing and packet information!]* He wrote, "While on a business trip from Johannesburg to East London I found a copy of *73* by accident. I have not seen [it] for years . . . it's a real collector's item . . . at US$5 [in Johannesburg] for the April 88 issue." ZS6ET recently received the Amateur of the Year Award from the South African Radio Amateur Foundation for his achievements in the foreign licensing field leading later to bilateral agreements with the US, Germany, Switzerland, Portugal, and Israel. At present he is the public relations representative for the Packet Radio Working Group of the SAR League and the spokesperson on foreign license affairs for the Johannesburg branch of SARL. He is also S4ZET and DF4YE, and ex A22PS.

Taiwan. In last month's list of special assistance to hams visiting other countries, the offer of Tim Chen BV2A/BV2B should have appeared. See the March issue, column 2, page 90, and his column—which did *not* appear in that issue but in May, page 96.

World. The International Telecommunication Union (ITU) has published three new economic studies which may be obtained in English, French, or Spanish for the costs listed below by writing the ITU Sales Service, Place des Nations, CH-1211 Geneva 20, Switzerland.

For 45 Swiss francs—**Telecommunications and the National Economy**: the role telecommunications plays in increasing the efficiency of economic, commercial, administrative, social, and emergency activities and services. For 33 Sfr—**The Benefits of Telecommunications to the Transportation Sector of Developing Countries**: a case study in the People's Democratic Republic of Yemen. For 37 Sfr—**Contribution of Telecommunications to the Earnings/Savings of Foreign Exchange in Developing Countries:** a case study of the Kenya situation.

AUSTRALIA

J.E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

[Jim Joyce saw to it that Australia was represented in these pages every month from November, 1983, to May, 1985, and, on average, every other month since then. He writes, "I feel, reluctantly, it is time to give it away . . . [so] I have sent in my resignation [to the WIA] as their 'Official Correspondent' to your magazine." We will welcome his replacement when the WIA names him/her, but we warn the new Hambassador for Australia that Jim will be a tough act to follow. His interest in and his competence in reporting may well be matched, but Jim often went beyond the call of duty, putting in his time and putting up his own money to help many hams who called on him for advice and information. (In fact, it will be best if the new correspondent doesn't put up with unreasonable requests, including the majority of them—those which were not intentionally unreasonable.) So thanks from all of us, Jim, and our very best wishes.

—RP.

As his farewell report, Jim sent in a long, detailed article on Willis Island, ". . . a tiny coral outcrop in the Coral Sea" now celebrating its 67th anniversary as one of the Bureau of Meteorology's remote Observing Offices. We will use parts of it over the coming months, but not its last paragraph, because that belongs here.

—Ed.]

Finally. After five years of being the WIA's Official Correspondent, and having written in that time over 60,000 words, trying to give the rest of the world an insight into Amateur Radio down under, I now feel it is time to step aside for some new blood to take over with new ideas and/or a different approach. Thank you for reading the "Aussie column" over the last five years. Cheers and beers for the last time, mates! **Jim VK3YJ.**

CHINA

Chang Han-Dong (BY4AOM)
Institute of Estuarine
and Coastal Research
East China Normal University
Shanghai 200062
People's Republic of China

BY, BT, and BV. Maybe you have worked several of these China or Taiwan ham stations. Soon you will hear the voices of BZ and BG. So far as I know, BZ will be earlier; it is the prefix of private calls and must be worked at club stations. BG is the prefix for private stations, and because of the price of SSB equipment, most of BG stations will work in CW. Some of my friends are going to make CW transceivers. When BG stations appear on the air, it means that Chinese ham radio will enter a new stage.

Please call 650674. When you come to China, maybe you hope you can operate in BY. In fact, many hams ask me about this when I work on the air. Yes, it's possible. When you arrive in Shanghai, bringing your license, you could call BY4AA's telephone number and you will be told the requirements and how to get to the station. BY4AA is the club station for the CRSA branch and has many high-quality rigs. You can work in not only CW and SSB but also SSTV, OSCAR, and RTTY. The manager of the station is Xu Lu (we call him Zulu); other members are Chen (YL), Wu (OM), and Zhou (OM). So please call 650674.

Shanghai's 2-meter net. Last month the first 2-meter net in Shanghai opened—it also was the first VHF amateur net in China. The prefix is B4, and the net consists of 26 2-meter FM stations. How this came about is interesting.

One year ago, when BY4AY (the club station for the Center of Shanghai Children Science and Technique) was set up, many other organizations hoped to set up club stations. However, first among many knotty problems was the lack of HF transceivers and any equipment special to amateurs; professional equipment is too expensive. But BY4AY learned from the Shanghai Post Office that there were obsolete 2-meter transceivers in its depository and there was a plan to sell them. So BY4AY bought them, changed the crystals for amateur bands and adjusted them. Now they have 10 fixed frequencies and 10-Watt output power, and 26 secondary schools and branches of the Shanghai Childrens Center bought them and set up the net. It is planned to extend the net, and to use it to attract more people into ham radio.

No Bureau in China. Last month a member of our club came back from Beijing city with a package weighing 3 kilograms. It was all QSL cards from all over the world, some, we were surprised to find, mailed a year or more ago. Amateur radio is new in China and we do not yet have a strong organization. BY1PK is the club of the CRSA (as W1AW is of the ARRL), but lacks members or funds to be a QSL service. So hams should send QSLs direct. Here is a list of some BY stations. (Table 1.) If you don't know the QTH you contacted, send your card to another station in the same city. We hope the CRSA will provide a QSL service as soon as possible; foreign hams too.

Addresses in China for QSLing.

BY...	PO Box	City
4SZ	51	Su Zhou
5QA	507	Fu Zhou
4AA	205	Shanghai
4AOM	227	Shanghai
4RN	2405	Nanjing
4AY	5304	Shanghai
8AA	6106	Beijing

Table 1.

GREAT BRITAIN

Jeff Maynard G4EJA
32 Waldorf Heights
Hawley Hill
Camberley GU17 9JQ
England

The UK Scene

The main event celebrating the 75th anniversary of the Radio Society of Great Britain has passed off with tremendous success. This very special occasion was marked by a national exhibition and convention at the National Exhibition Centre in Birmingham. It featured all the major suppliers and retailers of amateur radio equipment and specialist groups. Some used the occasion to announce new products or special offers. Yaesu showed the FT-747 allband transmitter and full-coverage receiver; ICOM demonstrated the IC-32E dualband VHF/UHF hand-portable; BNOS had the UK-made 144-MHz, 25 Watt transverter that's advertised as "user-friendly," and also from the UK, Microwave Modules promoted the 4-meter (70 MHz) equipment with a $35 discount to encourage use of this band.

The highlight was the opening ceremony, performed by His Royal Highness Prince Philip, Duke of Edinburgh. Introduced to RSGB President Sir Richard Davies, the Duke said in his opening speech that although he had broadcast a great many words by radio, he had never been a radio amateur. It turns out, however, that on one occasion at school he had built a working crystal set. He said he took much pleasure from being the RSGB Patron.

The whole opening ceremony was broadcast live on special GB2RS transmissions on 80, 40, 20, and 2 meters. GB2RS, the weekly news station of the RSGB, used the equipment of the exhibition special event station, GB75AC. So far, signal reports indicate satisfactory reception in Britain and Europe. The Duke later transmitted a message of greeting to another special event station, GB75ER, at Windsor Castle—the only type of transmission allowed by a non-license holder!

Only two weeks after the NEC binge, the first RSGB Data Symposium took place at the Harrow School in North West London, attended on each of its two days by about 125 people from the UK, the US, India, Senegal, Bermuda, New Zealand, France, Ireland, Belgium, and Germany. The 22-lecture program covered digital signalling techniques on British Rail, amateur satellites, RTTY picture composition, high-speed modem design, and packet radio networking; along with the last-named, a number of visitors, including some from the US, described their own networking.

The symposium was such a success that the RSGB quickly announced a second Data Symposium to be held the weekend of July 8–9, 1989, also at the Harrow School.

The growth in the amateur population continues, seemingly without end. At the time of this writing [August] callsigns in the series G0 J.. and G7B.. are being issued.

AMATEUR TELEVISION

NOVICES: NOW YOU CAN TRANSMIT VIDEO WITH OUR NEW TX23-1

Did you know that you as well as all classes of licensed amateurs can easily transmit live action color and sound video just like broadcast TV with our TX23-1 transmitter. Use any home TV camera and/or VCR, computer, etc. by plugging the composite video and audio into the front 10 pin or rear phono jacks. Call or write now for our complete ATV catalog including downconverters, transceivers, linear amps, and antennas for the 70, 33, & 23cm bands.

Only $299

Designed and built in the USA Value + Quality from over 25 years in ATV...W6ORG

TX23-1 one watt ATV transmitter crystaled for 1289.25 MHz runs on 12-14 Vdc @ .5A. PTL T/R switching. 7x7x2.5". TVC-12G Downconverter $109. Transmitters sold only to licensed amateurs for legal purposes verified in the latest Callbook or with copy of license sent with order.

(818) 447-4565 m-f 8am-5:30pm pst. **Visa, MC, COD**

P.C. ELECTRONICS
2522 Paxson Ln Arcadia CA 91006

Tom (W6ORG)
Maryann (WB6YSS)

NORFOLK ISLAND

Kirsti Jenkins-Smith VK9NL
PO Box 90
Norfolk Island, 2899
Australia

Our flag. When Norfolk Island gained a measure of self determination back in 1980, our flag also came into being. It is flown proudly from all our public buildings, alongside the Australian flag which, of course, represents "the last say" in important matters like foreign policy, communications, etc.

Our stamps. It has been many years since we started issuing our own postage stamps to boost local finances. We still receive, however, a number of SASEs with Australian stamps—strangely enough mostly from mainland Australia! Many Australians have only a hazy idea of what and where Norfolk Island is. They often confuse us with Lord Howe Island which is in fact classified as a part of New South Wales. These SASEs have to be bulk-mailed to friends on the mainland to be mailed there.

Your IRCs. While on the subject of stamps and SASEs, keep in mind that one IRC means *surface* mail postage, and surface mail leaves Norfolk Island only every couple of months, meaning you might have to add two months to the usual two or three months it may take for surface mail sent overseas from Australia. While in 1988 we enjoy excellent communications through regular air service, direct overseas dialling, telex, and facsimile, surface mail is surface mail, and the Earth is just as large as it was at the beginning of time! And by the way—*be sure your IRCs are stamped on the left hand side by the issuing post office.* They are not legal tender without the stamp.

Amateur radio activity on the Island is a bit up and down. We have lost Phil VK9NP, who returned to VK2 in February. VK9NS and VK9NL were absent on the HIDXA DXpedition to Howland Island, KH1, and the QSLing took up a lot of time, keeping us off the bands. Our tiny post office is coping well with the thousands of items of mail. It does happen that we find a little notice in our box about "an item too large for the box awaiting collection inside." This turns out to be a large mail-bag jammed full of mail. One recent peaceful Sunday Jim opened the box and got a shock when a hand appeared out of the box with a batch of mail. He thought it was the Adams Family "Thing." It was a member of the postal staff who saw daylight appearing in the box and took the opportunity to get rid of some of the overflow.

Visitors. Bruce VK9AD, son of VK9NS' visited over the Christmas period and was quite active, but as there usually is adequate activity from Norfolk Island, real DXpeditions here do not take place these days.

Harvey Brain made a surprise visit strictly for holiday purposes. Oldtimers will remember him as VQ9V and VQ9HB from the Seychelles, operating from St. Brandon and Agalea in 1963, followed by Farquar Island and Desroches Island later. He also was VQ8HCB when operating from Chagos in 1964. He lives in New Zealand now.

•••••

Two hundred years have passed since March 6, 1788, when a small group of convicts and their overseers stepped ashore on the uninhabited Norfolk Island and began to clear land to establish a settlement. So Norfolk Island, like Australia and the U.S., is celebrating a Bicentennial. It has been 200 years of ups and downs, booms and busts, but the people here today are proud to see their flag as a symbol of a tiny island which has emerged as a modern, largely self-supporting and economically independent community of the 1980s.

KENWOOD TS940 OWNERS

Are you frustrated tuning in SSB & CW signals because of the too fast main tuning rate of 10 Khz/revolution???
Try the NEW Copyrighted Giehl Electronics Software Kit!!

Features:

- Main tuning rate of 2 Khz/revolution LSB, USB, CW & FSK
- Main tuning rate of 20 Khz/revolution AM & FM
- Tuning rate automatically increases when the knob speed exceeds 2 turns per second to make the long QSY's fast
- Split dot CW problems solved
- Easy to install (simply remove the old IC chip from its socket and plug in the new Giehl Electronics IC chip).
- Complete instructions

Send check or money order for $25 to:

Giehl Electronics
P.O. Box 18335, Cincinnati, Ohio 45218

PERSONALIZED MUGS

Your Call sign & ARRL logo on a 10 oz. coffee or 15 oz. beer mug

A GREAT GIFT IDEA OR CLUB AWARD

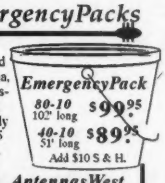
10 oz. Mug $5.95 — 2 for $10.95
15 oz. Mug $7.95 — 2 for $14.95
(pairs can have different designs) s/h $1.50 Per Order
Allow 6 wks delivery. NC residents add 5% tax

Send Check Today To: CALL SIGN CUPS
P.O. BOX 17062, Raleigh, NC 27619

CIRCLE 344 ON READER SERVICE CARD

QRV Antenna EmergencyPacks

EmergencyPacks contain QRV All Band kink-proof wx-sealed multi-band Dipole-V-Sloper antenna, 70' coax feedline. Quick Launch system, rotproof dacron support braid. 52 p Tech Manual. Complete. Ready for Action. One person installs in 15 minutes. Infopack $1 by 1st class mail.



Fastest Antennas in the West
Box 50062-S. Provo, UT 84605
AntennasWest (801) 373-8425

CIRCLE 304 ON READER SERVICE CARD

RADIO-TEL

COMMUNICATIONS CO.
#1 IN LAND MOBILE

Model	Freq. (MHz)	#Channels Capacity	Power (Watt)	Price ($)
KENWOOD MOBILES				
TK-6015	29-50	6	60	674.00
TK-710	148-174	4	25	494.00
TK-720	148-174	32	50	611.00
TK-810	450-512	4	25	584.00
TK-820	450-512	32	40	674.00
KENWOOD HANDHELDS				
TK-100	29-50	6	5	543.00
TK-200	148-174	6	5	498.00
TK-210	148-174	12	5	611.00
TK-300	450-512	6	5	551.00
TK-310	450-512	12	5	638.00
TK-320	450-470	16	2/4	494.00
STANDARD COMMUNICATIONS MOBILES				
C 867	138-174	2	30	438.00
GX 3000V	138-174	64	40	745.00
GX 3000U	406-512	64	35	810.00
STANDARD COMMUNICATIONS HANDHELDS				
HX 320V	134-174	4	5	379.00
C 835	150-156	6	5	427.00
HX 400V	138-174	25	5	720.00
HX 100U	450-512	2	1.5	250.00
HX 320U	450-512	4	5	427.00
C 735	450-470	6	5	475.00
HX 400U	406-512	25	5	768.00
MAXON MOBILES				
CM-4010	148-174	4	30	323.00
CM-4020	450-470	4	30	395.00
MAXON HANDHELDS				
CP-1015	144-174	2	1	159.00
CP-0510	144-174	4	5	314.00
CP-0520	450-470	4	5	359.00

We carry a full line of accessories for all our radios. Call us for information on long range full duplex, rural mobile or point to point.
We carry Radio-Telephones with up to a 60 mile range for domestic or export use.

RADIO COMMUNICATIONS
(213) 937-6766
1025 S. La Brea Ave.
Los Angeles, CA 90019

CIRCLE 362 ON READER SERVICE CARD

800-882-1343

ICOM

HF Equipment	IC-735	List	JUN's
ICOM			
IC-781 New Deluxe HF Rig		$5995	Call $
IC-761 Loaded with Extras		2699	Call $
IC-735 Gen. Cvg Xcvr		1099	Call $
IC-751A Gen. Cvg Xcvr		1699	Call $
Receivers			
IC-R7000 25-1300[8] MHz Rcvr		1199	Call $
IC-R71A 100 kHz-30 MHz Rcvr		999	Call $
VHF			
IC-228A/H		509/539	Call $
IC-28A/H FM Mobile 25w/45w		489/499	Call $
IC-02AT FM HT		409.95	Call $
IC-2GAT 2m 7w HT		429.95	Call $
IC-900 Six Band Mobile		639	Call $
UHF			
IC-48A FM Mobile 25w		509	Call $
IC-04AT FM HT		449	Call $
IC-4GAT 440MHz HT		429.95	Call $
220 MHz			
IC-38A 25w FM Xcvr		489	Call $
IC-32AT 2m/70cm HT		629.95	Call $

KENWOOD

KENWOOD		
HF Equipment		
TS-940S/AT Gen. Cvg Xcvr	2449.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1379.95	Call $
TS-140S Compact Gen. Cvg Xcvr	929.95	Call $
VHF		
TS-711A All Mode Base 25w	1029.95	Call $
TR-751A All Mode Mobile 25w	649.95	Call $
TM-221A 2m 45w	439.95	Call $
TM-2550A FM Mobile 45w	499.95	Call $
TM-2570A FM Mobile 70w	599.95	Call $
TH-215A 2m HT Has It All	379.95	Call $
TH-25AT 5w Pocket HT NEW	349.95	Call $
TM-721A 2m/70cm FM Mobile	649.95	Call $
UHF		
TM-421A Compact FM 35w	449.95	Call $
TH-45AT 5w Pocket HT NEW	369.95	Call $
220 MHz		
TM-3530A FM 220 MHz 25w	499.95	Call $
TM-321A Compact 25w Mobile	449.95	Call $
TH-315A Full Featured 2.5w HT	399.95	Call $

YAESU

YAESU		
HF Equipment		
FT-767 GX Gen. Cvg Xcvr	1929.95	Call $
FT-757 GX II Gen. Cvg Xcvr	1129.95	Call $
FT-747 GX New Economical Performer	889.95	Call $
FL-7000 15m-160m AMP	1995.00	Call $
VHF		
FT-212RH NEW 2m 45w	459.95	Call $
FT-712RH 70cm 35W	499.95	Call $
FT-290R All Mode Portable	599.95	Call $
FT-23 R/TT Mini HT	344.95	Call $
FT-209RH FM Handheld 5w	389.95	Call $
VHF/UHF Full Duplex		
FT-736R, New All Mode 2m/70cm	1749.95	Call $
Dual Bander		
FT-727R 2m/70cm HT	439.95	Call $
FT-109RH New HT	399.95	Call $

JUN'S ELECTRONICS
3919 Sepulveda Blvd.
Culver City, CA 90230
213-390-8003

JOIN ARRL

BENEFITS FOR YOU

QST, QSL Bureau, Awards, Low Cost Insurance, Operating Aids, Government Liaison and More—Much More!

MEMBERSHIP APPLICATION

Name _____ Call _____
Street _____
City _____ Prov./State _____ PC/ZIP _____

$25 in U.S. $36 elsewhere (U.S. funds) Licensed amateurs, or age 65 or over, upon submitting proof of age, may request the special dues rate of $20 in the U.S. $28 elsewhere, in (U.S. funds) Persons age 17 and younger may qualify for special rates, write for application.

For postal purposes, fifty percent of dues is allocated to QST, the balance for membership.

Charge to ☐ VISA ☐ Mastercard ☐ AMEX ☐ Discover Expires _____
Card Number _____ Signature _____

The American Radio Relay League
225 Main St. Newington, CT. 06111 USA 73

Others May Try to Imitate, But...

Only One Can Be The Best

Morse Code - Baudot - ASCII - AMTOR - Packet - Facsimile - Navtex

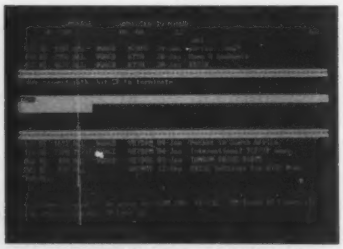
Amateur Net Price $319.95

It's a lesson you learn very early in life. Many can be good, some may be better, but only one can be the best. The PK-232 is the best multi-mode data controller you can buy.

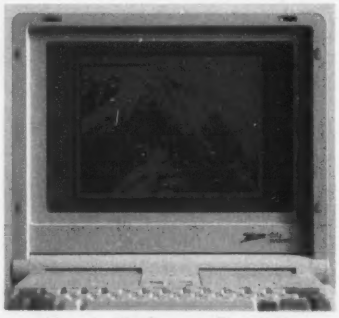
1 Versatility

The PK-232 should be listed in the amateur radio dictionary under the word Versatile. One data controller that can transmit and receive in six digital modes, and can be used with almost every computer or data terminal. You can even monitor Navtex, the new marine weather and navigational system. Don't forget two radio ports for both VHF and HF, and a no compromise VHF/HF/CW internal modem with an eight pole bandpass filter followed by a limiter discriminator with automatic threshold control.

The internal decoding program (SIAM[tm]) feature can even identify different types of signals for you, including some simple types of RTTY encryption. The only software your computer needs is a terminal program.



PC Pakratt Packet TX/RX Display



Facsimile Screen Display

2 Software Support

While you can use most modem or communications programs with the PK-232, AEA has two very special packages available exclusively for the PK-232....PC Pakratt with Fax for IBM PC and compatible computers, and Com Pakratt with Fax for the Commodore 64 and 128.

Each package includes a terminal program with split screen display, QSO buffer, disk storage of received data, and printer operation, and a second program for transmission/reception and screen display of facsimile signals. The IBM programs are on 5-1/4" disk and the Commodore programs are plug-in ROM cartridges.

3 Proven Winner

No matter what computer or terminal you plan to use, the PK-232 is the best choice for a multi-mode data controller. Over 20,000 amateurs around the world have on-air tested the PK-232 for you. They, along with most major U.S. amateur magazines, have reviewed the PK-232 and found it to be a good value and excellent addition to the ham station.

No other multi-mode controller offers the features and performance of the PK-232. Don't be fooled by imitations. Ask your friends, or call the local amateur radio store. We're confident the PK-232 reputation will convince you that it's time to order your very own PK-232.

Call an authorized AEA dealer today. You deserve the best you can buy, you deserve the PK- 232.

Advanced Electronic Applications, Inc.

P.O. Box C-2160
Lynnwood, WA 98036
206-775-7373

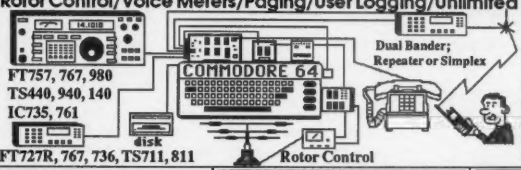
AEA Brings you the Breakthrough!

CIRCLE 65 ON READER SERVICE CARD

ENGINEERING CONSULTING

SUPER COMSHACK 64

Programable Repeater Controller/HF & VHF Remotes/Autopatch/CW Practice
Rotor Control/Voice Meters/Paging/User Logging/Unlimited Vocabulary/Packet BBS



Set up your own personal or club repeater with any Dual band radio from your home or club site. **Delete any user's access code without affecting others.** The CS64S now has **the most advanced control features available at any price!**

REPEATER CONTROLLER
- *Remote Change all variables
- *Clear **Synthesized voice**
- *Program mail box or select ID tail voice message or CW
- ***Alarm clock; auto execute**
- *Macro strings/user logging
- ***Individual user sys. codes**
- *CW Code practice & Voice
- *Talking meters; hi/lo alarm

H.F. REMOTE #1
- *20 Macro mem/mode sel.
- *Scan up/down;set rate/step
- *Voice ack. all commands
- *Select any C.A.T. radio

AUTOPATCH REVERSE PATCH
- ***1020** (18 digit) tele. #'s stored
- ***300 users/CTCSS+2 tone page**
- ***50 enable/disable tel.#'s**
- ***Directed/general/reverse page**
- ***Programable answer message**
- *Full or Half duplex (level cont,)
- *Security mode; T.Tone readback
- ***Reverse Patch active all modes**
- *Call waiting/Quick dial/auto off
- *Control via Patch/mem redial

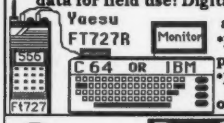
V.H.F. REMOTE #2
- *Dual VFO's/Rev/Split/COR
- *Set Scan inc. & offset/resume
- *Monitor mode & Link repeaters

Super Comshack 64
Model **CS64S $349.95 + $4.00** shipping USA; incl. pre-wired, tested computer interface, disk, cables & manual (simplex version on request)

SYSTEM OPTIONS
- ***External Relay Controls** 3 DPDT relays; 5 Open col. out...**CS-8 $79.95**
- *Convert rotor D.C. meter voltage to digital display & voice...**HM1 $49.95**
- *2 Voice Meter & Alarm inputs/8 On/off cont. /Packet.BBS..**PK8 $149.95**
- *EPROM Auto boot CArtridge custom with your system.....**CART...$99.95**
- *Manual (Refunded).....**MN1 $15.00**

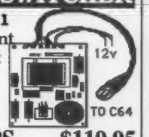
MINI C.A.T. COMPUTER CONTROL FT-727R

Programs and Scans Ham/General coverage. Converts H.T. into a powerful 100 ch. scanner & programs all data for field use! Digital "S" meter; comment fields; auto resume & delay; lockouts



- ***Loads & programs all FT-727R parameters in less that 15 sec.**
- *Includes hardware & disk for **C64 or IBM.** **Model 727 $39.95**

12 volt C64 SWITCHER



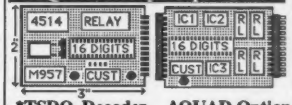
- ***Power C64 & 1541**
- *70Khz 75% effecient
- *Outputs 5v.@2A & 9 VAC @ 60Hz
- *Crystal time base
- ***Plugs into C64**

MODEL DCPS.....$119.95

Decode-A-Pad

Touchtone to RS232 (300 baud interface)
Program your computer in basic to decode multidigit "strings" sound alarms, **observe codes, includes basic program** for C64 VIC20;128; IBM. A must for repeaters."**Decode-A-Pad**" **works on all computers** **Model DAP $ 89.95**

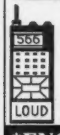
Touchtone 4 Digit Decoder & Quad Relay Expansion



***TSDQ Decoder** ^QUAD Option
- *+8 to +20 V. supply; low power drain
- *Field prog. jumpers; 50,000 codes
- *Momentary & Latching: DPDT relay
- *Wrong dig. reset;LED's digits+latch
- *24 Pin Conn. hook up & Expansion
- ^**Quad adds (4) DPDT 2A. Relays & individual 3 to 5 Digit on/off codes!**
- ^Status outputs; wired & tested

TSDQ $79.95 QUAD $99.95 wired & tested

Audio Blaster **IC02;04; 2AT; U16; FT 727R; 209;23;73**



Module installs inside the radio in 15 Min. Boost audio to 1 watt! Low standby drain/Corrects low audio/ **1000's of happy users.** Miniature audio amplifier **Used by Police, Fire, Emergency, adds 40 dB gain!** for all H.T's when it needs to be LOUD!

Model AB1S-$ 22.95

***ENGINEERING CONSULTING * 583 CANDLEWOOD ST.* BREA, CA. 92621**
MASTERCARD ** VISA CA. RES. ADD 6%** TEL :(714) 671-2009**

Sparky J-Antennas
• Install Fast • Extend Range • Improve Reception •

The Sparky J-Antenna is a flexible half wave radiator fed by two wavelengths of low loss coax through an efficient linear matching transformer. Sparky J's beat duckies. 1/4, & 5/8 wave antennas. need no ground plane. Low flat SWR curve gives edge to edge band coverage. Great portable--rolls up to fit in pocket. Completely assembled with BNC connector.
• Easily hidden • Effective indoors or out. • Money-back guarantee •
Available for every band from 28 to 440 MHz
$29.95 each Two for $55.00 Add $5 P & H
Infopack $1 by 1st class mail
AntennasWest
Box 50062-S, Provo, UT 84605 (801) 373-8425

CIRCLE 5 ON READER SERVICE CARD

FOR THE BEST IN LINEAR AMPLIFIERS, ANTENNA TUNERS, TRANSCEIVERS, METERS ETC. REPLACEMENT PARTS, FACTORY SERVICE, NEW PRODUCT INFO. DOMESTIC, INTERNATIONAL DEALER INQUIRIES INVITED.

PO Box H
E. Rockaway, LI
NY 11518, USA
TLX 4758244
516/536-2620

the New DenTron Radio co. Inc.

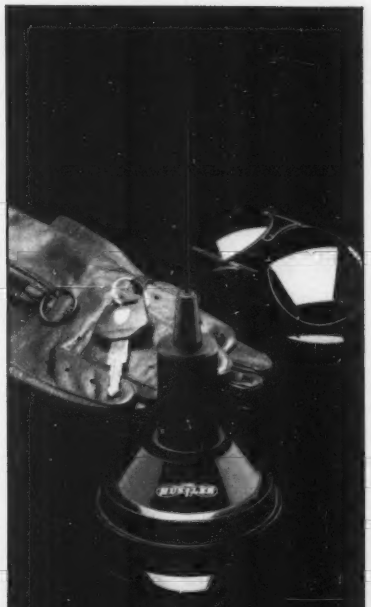
CIRCLE 263 ON READER SERVICE CARD

WHEN DOES ONE EQUAL TWO?
WHEN IT'S A TAD M8 FM TRANSCEIVER
COMMERCIAL & AMATEUR BANDS IN ONE UNIT

- Ideal for MARS, Vol. Fire, EMT, B'cast RPU, Police, etc.
- Fully Field Programmable
- 99 Channels
- True 40 Watt Power
- Extremely Rugged
- Multi Function LCD display
- Frequency Range 136-174 or 430-512 mHz
- FCC & DOC type accept.
- Low Cost DTMF mike avail.
- Overnight Shipping Available
- Shipped Complete w/Mike, Mobile Slide Mount & Power Cable
- Base Station P.S.; mobile Antennas etc. in Stock

AXM Incorporated
11791 Loara St.
Garden Grove, CA 92640-2321
Write or Call 714-638-8807 for immediate information

CIRCLE 243 ON READER SERVICE CARD



Drive A Winner

The performance of your system depends upon the antenna it drives.

Drive A Winner – Hustler.

Yes, please send information on your line of amateur antennas to:

NAME _____

ADDRESS _____

CITY STATE ZIP

HUSTLER®

One Newtronics Place
Mineral Wells, Texas 76067
(817) 325-1386

CIRCLE 269 ON READER SERVICE CARD

DEALER DIRECTORY

CALIFORNIA

Burbank

New HAM store open and ready to make a DEAL. We carry all lines, ship UPS, and are open Sunday. **A-TECH ELECTRONICS, 1033 Hollywood Way, Burbank CA 91505; (818)845-9203.**

San Diego

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 4633 Convoy St., San Diego CA 92111; (619)279-6802.**

COLORADO

Denver

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 5115 N. Federal Blvd. #32, Denver CO 80221; (303)458-5444.**

DELAWARE

New Castle

Factory authorized dealer! Yaesu, ICOM, Ten-Tec, KDK, Kenwood, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **DELAWARE AMATEUR SUPPLY, 71 Meadow Road, New Castle DE 19720; (302)328-7728.**

Wilmington

Delaware's friendliest ham store. Also Shortwave supplies. **AMATEUR & ADVANCED COMMUNICATIONS, 3208 Concord Pike, Wilmington DE 19803; (302)478-2757.**

FLORIDA

Stuart

Radio Shack Computers and all other equipment. Nationwide. Best prices. Call FREE on orders over $50. **COTRONICS INC., Radio Shack Dealer, 2200 S.E. Federal Highway, Stuart, FL 34994 (407) 286-3040.**

IDAHO

Preston

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. **ROSS DISTRIBUTING, 78 S. State, Preston ID 83263; (208)852-0830.**

KANSAS

Wellington

We have it! ASTRON, BUTTERNUT, ENCOMM, HEATHKIT, GORDON WEST, KANTRONICS, LASER COMPUTERS, MFJ, RADIO SHACK, TEN-TEC, VALOR ANTENNAS & more. Small town service with discount prices. **DANDYS, 124 So. Washington, Wellington, KS. 67152, (316) 326-6314.**

MASSACHUSETTS

Littleton

Reliable hamstore servicing New England. Full line of Kenwood and ICOM stocked and serviced. AEA, ARRL Publications, Anphenol, Alpha Delta, Austin, Avanti, Alinco, Ameco, Bencher, B&W, Cushcraft, Carol Cable, Daiwa, Hustler, KLM, Kenpro, Larsen, Rohn, RF Concepts, Tokyo Hypower, Trac Keyers, Vibroplex, Welz, etc. **TELCOM, INC., 675 Great Road (Rt. 119) Littleton MA 01460; (508)486-3400, (3040).**

MISSOURI

St. Louis

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 8123 Page Blvd., St. Louis MO 63130; (314)427-6116.**

NEW HAMPSHIRE

Derry

Serving the ham community with new and used equipment. We stock and service most major lines: AEA, Astron, B&W, Cushcraft, Encomm, Hy-Gain, Hustler, ICOM, Kenwood, KLM, Larsen, Mirage, Mosley; books, rotors, cable and connectors. Business hours Mon.-Sat. 10-5, Thursday 10-7. Closed Sun./Holidays. **RIVENDELL ELECTRONICS, 8 Londonderry Road, Derry NH 03038; (603)434-5371.**

NEW JERSEY

Eatontown

Electronics Supplies for amateurs. Ten-Tec, Barker and Williamson, Cushcraft, Hustler, etc. **ATKINSON AND SMITH, 17 Lewis St., Eatontown NJ 07724 (201) 542-2447.**

Lyndhurst

A full service Ham Radio Store! Discount sales and service on most major brands. Monday to Friday 10:00am to 7:00pm, Saturday 9:00am to 3:00pm ¼ mile south of Rt.3. **ABARIS SYSTEMS, 227 Stuyvesant Avenue, Lyndhurst NJ 07071; (201)939-0015.**

Park Ridge

Bergen County's oldest and only SWL/Amateur dealer. Specializing in HF receiving systems, antennas, ham/SWL accessories, books. Kenwood, JRC, Yaesu, Icom. 1 mile from Garden State Parkway Exit 172. Tu-Fri 10-5; Sat 10-3. **GILFER SHORTWAVE, 52 Park Avenue, Park Ridge, NJ 07656; (201) 391-7887.**

NEW YORK

Jamestown

Western New York's finest amateur radio dealer featuring ICOM-Larsen-AEA-Hamtronics-Astron. New and used gear. **VHF COMMUNICATIONS, 915 North Main St., Jamestown NY 14701, (716)664-6345.**

New York

New York City's Largest Full Service Ham and commercial Radio Store. **BARRY ELECTRONICS, 512 Broadway, New York NY 10012; (212)925-7000.**

NORTH CAROLINA

Greensboro

9a.m. to 7p.m. Closed Monday. ICOM our specialty-Sales & Service. **F&M ELECTRONICS, 3520 Rockingham Road, Greensboro NC 27407; (919)299-3437.**

OHIO

Columbus

Central Ohio's full-line authorized dealer for Kenwood, ICOM, Yaesu, Ten-Tec, Info-Tech, Japan Radio, AEA, Cushcraft, Hustler, and Butternut. New and used equipment on display and operational in our 4000 sq.ft. store. Large SWL department, too. **UNIVERSAL AMATEUR RADIO, 1280 Aida Drive, Reynoldsburg (Columbus) OH 43068; (614)866-4267.**

PENNSYLVANIA

Trevose

Same Location for over 38 years. **HAMTRONICS, DIV. OF TREVOSE ELECTRONICS, 4033 Brownsville Road, Trevose PA 19047; (215)357-1400.**

TENNESSEE

Memphis

M-F 9-5; Sat 9-12; Kenwood, ICOM, Ten-Tec, Cushcraft, Hy-Gain, Hustler, Larsen, AEA, Mirage, Ameritron, etc. **MEMPHIS AMATEUR ELECTRONICS, 1465 Wells Station Road, Memphis TN 38108; Call Toll Free: (800)238-6168.**

TEXAS

Dallas

In Dallas since 1960. We feature Kenwood, ICOM, Yaesu, AEA, Butternut, Rohn, amateur publications, and a full line of accessories. Factory authorized Kenwood Service Center. **ELECTRONIC CENTER, INC., 2809 Ross Ave., Dallas TX 75201; (214)969-1936.**

Houston

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5.**GATEWAY ELECTRONICS, 10645 Richmond Ave. #100, Houston TX 77042; (713)978-6575.**

Southwest Houston

Full line of Equipment and Accessories, in-house service, Texas #1 Ten Tec Dealer! **MISSION COMMUNICATIONS, 11903 Alief-Clodine, Suite 500, Houston TX 77082; (713)879-7764.**

DEALERS

Your company name and message can contain up to 25 words for as little as $199 yearly (prepaid), or $50 for three months (prepaid). No mention of mail-order business permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the April '88 issue must be in our hands by February 1st. Mail to *73 Amateur Radio*, Rebecca Niemela, WGE Center, Peterborough, NH 03458.

ATLAS RADIO & UNIDEN ELECTRONICS TWO LEADERS IN AMERICAN HAM RADIO

PRESIDENT

AR/HR 2510
10 METER MOBILE TRANSCEIVER

Comes complete - ready for installation: Mobile mounting bracket, Scanning microphone, power cord, etc., etc.

Call for price, you will not be disappointed.

That's right.
Atlas Radio together with Uniden Corporation of America have joined forces to bring you this new exciting product. The 2510 tenmeter mobile transceiver.

Many of the exciting new features are...25W PEP USB/LSB and 25W CW. LCD Digital readout display with full frequency coverage from 28.0000 MHz to 29.6999 MHz Digital VFO Synthesized for Superior stability. Preprogrammed memory channels. RIT receive Incremental tuning Noise Blanker. Touch Tone scanning microphone & much much more. Remember Atlas Radio Co. will warranty your 2510 mobile transceiver for two years, full replacement, no questions asked. From Atlas Radio & Uniden Electronics, two World Leaders in portable communications. Order direct from this ad. Call anytime day or night, seven days a week, or write for free color brochure. Export inquiries invited.

Note: Atlas Radio is fully equipped to service our past models of equipment, 180, 210X, 215X, 350XL, Etc.

ATLAS
RADIO INC.

PO Box 763 • Lynbrook, LI, NY 11563
(516) 678-3904

CIRCLE 363 ON READER SERVICE CARD

ege inc

REMEMBER - BUY EARLY

YOUR BEST CHRISTMAS BUYS

ege inc

Virginia ICOM Day
Saturday, November 12

GIFT SUGGESTIONS

New Hampshire
New Store Location

UNDER $25

BK136 TECH/GEN MANUAL	5.00
CALL BOOKS 1989	24.95
BK141 EXTRA CLASS	5.00
BK120 REPEATER DIRECT.	5.00
BK102 *NEW* ANTENNA BK.	18.00
LARSEN KD4142HQ	16.95
KANTRONICS MAX-FAX	19.95
ICOM HS10 HEADSET	24.50
ICOM HS10SA/SB	24.50
ICOM LC11,12, OR 14	20.50
ICOM LC24,25,26, OR 27	13.95
MFJ 109 WORLD CLOCK	18.95
MFJ 108 24HR.DUAL LCD	19.95
MFJ1282 STARTER KIT DISK	19.95
MFJ1284 STARTER KITTAPE	19.95
MFJ 284 SPEAKER MIC	24.95
MFJ1702 2POS.ANT.SWITCH	19.95
UNIDELLA W2AU11	16.95
VANGORDEN HI-Q	14.95
VANGODEN D10 10M	19.50
VANGORDEN D15 15M	20.95
VANGORDEN D20 20M	22.95
VANGORDEN D40 40M	24.95
VANGORDEN QSL CARD	4.95
ARRL 1989 HANDBOOK	21.95

UNDER $50

ALLIANCE U110	49.95
ANT SPEC AP1513G	35.95
ANT SPEC AP4503G	35.95
CUSHCRAFT CS147M	38.95
CUSHCRAFT ARX2B	40.95
CUSHCRAFT ARX450B	40.95
CUSHCRAFT 124WB	38.95
ICOM HM46 SPKR MIC	31.99
ICOM HM46L SPKR MIC	31.99
K2RAG RAG10,15,20	35.95
K2RAG RAG4 2KW BALUN	24.95
K2RAG RAG40 40MDIPOLE	45.95
K2RAG RAG80 80M DIPOLE	49.95
KANTRONICS KANTERM	29.95
KENWOOD SMC30	49.95
KENWOOD SMC31	49.95
KETSU5 ENCODER	49.95
KETSU6 ENCODER	45.95
LARSEN KG144	49.95
LARSEN KG144PL	44.95
LARSEN AD2/70	43.95
LARSEN KD14142HW	29.95
MFJ 250 1KW WET	40.95
MFJ 260 300W DRY	26.95
MFJ 1286 GREY LINE ADV.	29.95
NYE 020001LOW PASSFILT.	31.95
NYE 404002OSCIL.W/KEY	29.95
VAN GORDEN G5RV	45.95
YAESU FNB10 BATTERY	41.95
YAESU MH12A2B	41.95
YAESU MH18A2B	41.95

UNDER $75

ALINCO ELH230G 2M AMP	72.95
ASTRON RS10A PWR SPLY	61.95
ASTRON RS12APWR SPLY	71.95
B&W ASW60LSWL ANT	66.95
BENCHER BY1 BLACK	54.00
BENCHER BY2 CHROME	66.50
ICOM BP5 BATTERY	65.00
ICOM EX243 KEYER	64.50
ICOM FL32 CW FILTER	69.00
ICOM RC11 OR RC12	70.99
KENWOOD HS5	70.99
MFJ 931 GRND TUNER	73.95
SHURE 444D DESK MIC	59.95
YAESU FNB4 OR FNB4A	64.95
YAESU FNB12 BATTERY	59.95
YAESU FTS12 ENCODER	61.95

UNDER $100

ALINCO ELH230D 2M AMP	89.95
ASTRON RS12M	92.95
ASTRON RS20A PWR SPLY	91.95
B&W AS80 80M DIPOLE	94.95
CUSHCRAFT A743	84.95
CUSHCRAFT A744	84.95
CUSHCRAFT 215WB	83.95
HYGAIN 40M KIT EXP.14	99.95
ICOM BC35 CHARGER	79.00
ICOM BP7 OR BP8	79.95
ICOM GC5 24HR WORLD CLK	79.00
ICOM SM8 DESK MIC	89.00
MFJ 482B MEMORY KEYER	91.95
MFJ 941D TUNER	92.95
SANGEAN ATS801 RECVR.	89.95
SONY AN1 ACTIVE ANTENNA	79.95
TELEX PROCOM250	72.90

UNDER $150

ALLIANCE HD73 ROTOR	119.95
ALINCO ELH260D 2M AMP	124.95
UNIDEN 55XL SCANNER	135.95
BUTTERNUT HF6VX	119.00
DIAWA LA2065R 2M AMP	122.95
HYGAIN 18AVT/WB	137.50
ICOM SM10 DESK MIC	130.95
MFJ 1270B PACKET	129.95
YAESU MD1B8 DESK MIC	109.95
YAESU SU726	129.95

UNDER $200

CUSHCRAFT AP8 HF VERT.	153.95
DOCKING BOOSTERWP20	169.95
HYGAIN 105BAS 10M BEAM	173.95
HYGAIN CD45II ROTOR	199.95
ICOM FL44A SSB FILTER	164.95
ICOM PS15 PWR SUPPLY	156.95
KENWOOD AT130 TUNER	184.95
KENWOOD PS430S	175.00
MFJ 1274 PACKET	152.95
SANGEAN ATS803 RCVR	179.95
UNIDEN 70XLT SCANNER	174.95

UNDER $250

CUSHCRAFT A3 HF BEAM	249.95
CUSHCRAFT R4 HF VERT.	249.95
DIAWA CNW419 TUNER	225.95
HEATHKIT HK21 PACKET	215.95
KENWOOD TH31BT 220 HH	239.95
MFJ 1278 ALL MODE TNC	225.95
SONY 2003 SWL RECEIVER	249.95
YAESU 6M736 6M MODULE	234.95

UNDER $300

ALINCO ALR72T	269.95
ALINCO DJ100T 2M HH	263.95
DOCKBOOST.WP727DX	299.95
HYGAIN 155BAS	265.00
HYGAIN HAMIV ROTOR	294.95
ICOM 03AT 220MHz HH	269.95
ICOM U2AT 2M HANDY	286.95
ICOM U4AT 440MHz HH	299.95
KANTRONICS KAM	284.00
KENWOOD TH205AT	CALL
KENWOOD TH25AT	CALL
MFJ 989 3KW TUNER	299.95
SONY SW1S RECEIVER	284.50
UNIDEN 200XLT SCANNER	299.95
UNIDEN 760XLT SCANNER	299.95
YAESU FT23R 2M HANDY	259.95
YAESU FT23R/TT 2M HH	289.95
YAESU FT33R 220MHz HH	299.95
YAESU FT73R 440MHz HH	269.95

PACKAGE DEALS

TS140
$929.95

includes
TS140 HF Transceiver
Astron RS20A Power Supply
UPS Borwn Shipping
EGE One Year Extended Warranty

MFJ 1278
$244.95

includes
MFJ 1278 TNC
1284 Starter Package
UPS Brown Shipping

TS440AT
$1379.95

includes
TS440AT HF Transceiver
MC80 Desk Mic
Astron RS20A Power Supply
UPS Brown Shipping
EGE One Year Extended Warranty

CALL FOR OTHER PACKAGES

Orders & Quotes Toll Free 800-444-4799

Prices are subject to change without notice or obligation

ege inc

New Fall1988 Buyers Guide/Catalog Available-Send $1

EGE VIRGINIA
14803 Build America Drive, Bldg B
Woodbridge, Virginia 22191
Information: (703) 643-1063
Service Dept: (703) 494-8750
Fax: (703) 494-3679

Store Hours: M - F 10-6; Sat: 10-4
Order Hours: M - F 9-6, Sat: 10-4

EGE NEW ENGLAND
224 N. Broadway
Salem, New Hamshire 03079
New England (NH Included)
Toll Free: 800-444-0047
Info & Service: (603) 898-3750

Store Hours: MTuWF: 10-5
Th: 12-8; Sat: 10-4

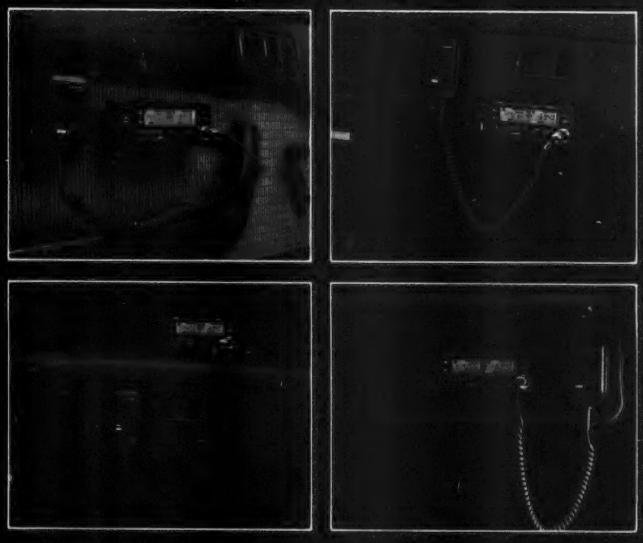
VISA MasterCard

Our Associate store:
Lacombe Distributors
Davis & Jackson Road
P.O. Box 293
Lacombe, Louisiana 70445
Phone: (504) 882-5355

11/88

CIRCLE 133 ON READER SERVICE CARD

YAESU'S DUAL BANDER GOES PLACES OTHER MOBILES DON'T.



FT-4700RH control head (1 15/16" x 5 7/8" x 1")

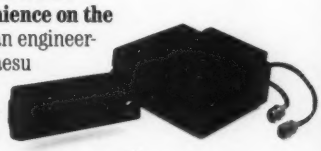
Introducing Yaesu's FT-4700RH dual-band mobile. Choose Yaesu's FT-4700RH, and you open the door to a lot of tight spaces.

While other dual banders just won't fit in today's small cars, the FT-4700RH utilizes a versatile "remote head" design. So you can mount the "brains" on your dash, visor, or door, and hide the "muscle" under your seat.

High-performance package. Packing a solid 50-watt punch on 2 meters (40 watts on 70 cm), the FT-4700RH includes Dual-Band Watch for simultaneous monitoring of both bands, with independent squelch settings on the main and secondary bands. When you transmit, opposite band monitoring goes on in a full-duplex mode.

You can adjust the relative volume of the two receive channels with the balance control, too. And with Yaesu's bright LCD display, transceiver status is clearly visible in sunlight or shade.

Convenience on the road. Human engineering, long a Yaesu specialty, is an important aspect of the FT-4700RH design. The ten-button front panel keypad includes a "do-re-mi" audible command verification, and all important controls are backlit for night operation. Plus you get extended receive coverage of 140-174 MHz (MARS/CAP permit required for transmit on 140-150 MHz, or 430-450 MHz on 70 cm). Nine memory channels on each band. High/low power selection (low power: five watts). One-touch reverse repeater shift button. Optional CTCSS module. And 16-key DTMF microphone.



Optional accessories. FTS-8 CTCSS unit. MH-15D8 Autodialer Microphone with 10-telephone number memory. SP-3 or SP-4 External Speakers. And YH-1 Headset/Boom Mic or MF-1A3B Flex-Arm Boom Mic, both with SB-10 PTT Switch Unit.

Discover Yaesu's FT-4700RH today. And see what "high performance" really means. For dual-band mobile operation, Yaesu's FT-4700RH really fits!

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. **Repair Service:** (213) 404-4884. **Parts:** (213) 404-4847. Prices and specifications subject to change without notice.

YAESU

CIRCLE 165 ON READER SERVICE CARD

KENWOOD

pacesetter in Amateur Radio

TH-55A! 1200 MHz Here Now!

Compact Breakthrough!

TH-25AT/45AT

New Pocket Portable Transceivers

The all-new TH-25 Series of pocket transceivers is here! Wide-band frequency coverage, LCD display, 5 watt option, plus...

- Frequency coverage: **TH-25AT:** 141-163 MHz (Rx); 144-148 MHz (Tx). (Modifiable for MARS/CAP. Permits required.)
  TH-45AT: 438-450 MHz.
- Automatic Power Control (APC) circuit for reliable RF output and final protection.
- 14 memories; two for **any** "odd split" (5 kHz steps).
- Automatic offset selection (TH-25AT).
- 5 Watts from 12 VDC or PB-8 battery pack.
- Large multi-function LCD display.
- Rotary dial selects memory, frequency, CTCSS and scan direction.
- T-ALERT for quiet monitoring. Tone Alert beeps when squelch is opened.
- Band scan and memory scan.
- Automatic "power off" circuit.
- Water resistant.
- CTCSS encoder /decoder optional (TSU-6).
- **Supplied accessories:** StubbyDuk, PB-6 battery pack for 2.5 watts output, wall charger, belt hook, wrist strap, water resistant dust caps

Optional accessories:

• **PB-5** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6** 7.2 V, 600 mAh NiCd pack • **PB-7** 7.2 V, 1100 mAh NiCd pack • **PB-8** 12 V, 600 mAh NiCd for 5 W output • **PB-9** 7.2 V, 600 mAh NiCd with built-in charger • **BC-10** Compact charger • **BC-11** Rapid charger • **BT-6** AAA battery case • **DC-1/PG-2V** DC adapter • **HMC-2** Headset with VOX and PTT • **SC-14, 15, 16** Soft cases • **SMC-30/31** Speaker mics. • **TSU-6** CTCSS decode unit • **WR-1** Water resistant bag

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.